ExaSAN SW16

User Guide

Support Host Bus Adapter:

- *PCIe 2.0: Z1M-G2*
- *PCIe 3.0: Z2M-G3*

Support Host Convertor:

- *Thunderbolt2.0 to PCIe2.0: C1M-G2*

Support RAID system:

- *PCIe 2.0: A12S2-PS*
- *PCIe 3.0: B08S3-PS, A08S3-PS, A16S3-PS*

Accusys Storage Ltd.

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Revision Sheet

Release No.	Date	Revision Description
V1.0	01/10/2013	Initial release on CD.
V1.1	20/01/2014	Add UL warning message on the last page
V2.0	04/09/2014	Update on PCIe3.0 information
V2.1	14/10/2014	Add C1M-G2, Add LUNmasking Add chapter plan you SAN Add appendixB RAIDGuard X introduction Remove SANit

PREFACE

Notice

The product features and specifications described in this guide are subject to change without notice.

The manufacturer shall not be liable for any damage, or the loss of information resulting from the performance or use of the information contained herein.

About This Guide

Congratulations on your purchase of the ExaSAN (pronounced X-sa-SAN) switch “SW16”, a revolutionary high bandwidth PCIexpress based SAN switch, specifically developed for post production environments. It delivers stability, exceptional performance, and scalable capacity at a very affordable cost.

This guide also contains instructions for installing and using the ExaSAN PCIe switch, RAID (Redundant Array of Independent Disks) technologies, SANit (SAN management software) and RAIDGuard X (ExaSAN’s RAID management software).

If you are new to ExaSAN switch, RAID, SANit and RAIDGuard X, this guide will help you become familiar with these technologies, and assist you in setting up and using ExaSAN storage with the SW16. If you are already familiar with these technologies, use this guide as a reference for implementing your ExaSAN SAN solution to achieve maximum performance and reliability.

For details of hardware installation, setup, configuration and considerations, see

- Chapter 1, “Introducing ExaSAN PCIe2.0 Switch SW16”
- Chapter 2, “Preparing to setup an ExaSAN SAN environment”
- Chapter 3, “Installing ExaSAN SAN environment”
- Chapter 4, “Using Switch Web GUI”
- Chapter 5, “RAID Overview”
- Chapter 6, “Appendix”

Guide to Conventions

Inside the double boxes is the important information that users should be aware of:

Caution
This indicates the existence of a potential hazard that could result in personal injury, damage to your equipment or loss of data if the safety instruction is not observed.

Note
This indicates useful tips on getting the most from your Accusys ExaSAN RAID system.

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Document version 2.0

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This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that may cause undesired operation.

ExaSAN SW16 User Guide

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1. Introducing ExaSAN PCIe2.0 switch

1. Introducing ExaSAN PCIe2.0 switch

1.1 Overview

1.1.1 What is the ExaSAN Solution

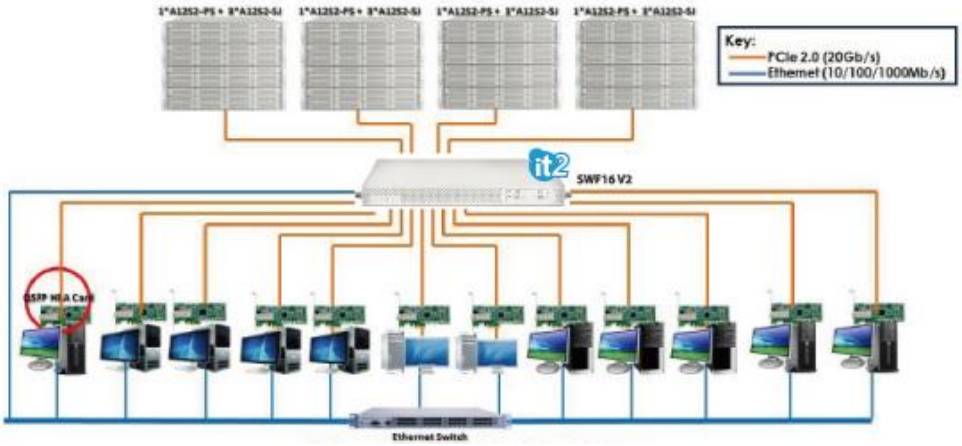
Developed by Accusys Storage Ltd., a worldwide leader in RAID (Redundant Array of Independent Disks) storage systems, ExaSAN (pronounced “X-sa-SAN”) is a family of storage and switch products that take advantage of well known PCIe (PCI Express) technology speeds, standards, and roadmap.

The current ExaSAN products employ PCIe2.0 protocol that provides 5 Gb/s per lane transfers. With 4 lane QSFP (Quad SFP) connector and cable, ExaSAN can transfer up to 20 Gb/s by using single connection. With a dual port QSFP HBA, data transfers up to 40 Gb/s.

Post production work including non-linear editing (NLE) requires high bandwidth storage to quickly move the volume of data being processed and ExaSAN storage solution meets those demands. The high bandwidth provided by ExaSAN technology allows the client to complete editing tasks in a much shorter time to save time and money.

ExaSAN solution, including its complete line of rack mount RAID systems, tower RAID systems, PCIe switch systems and accessories, support to build DAS (directly attached storage) and SAN (storage attached network) environments. Figures below depict the ExaSAN A16S3-PS system solution architecture in DAS and SAN environment.

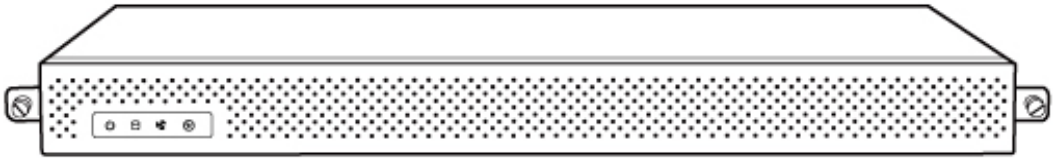
A08S3-PS DAS environment



SAN environment with SW16

1.1.2 ExaSAN Switch SW16 Features

The ExaSAN SW16 is PCIe 2.0 SAN switch in a 1U rackmount enclosure employing the latest PCIe2.0 technology with support for 12 PCIe clients and 4 PCIe RAID storages. The total bandwidth of SW16 is up to 80 Gb/s.



SW16 Front view

1. **Host Interface**
   - QSFP PCIe2.0 x4 lanes. 12 ports
   - Support host with Z1M-G2 (PCIe2.0), Z2M-G3(PCIe3.0)
   - Support convertor C1M-G2 (Thunderbolt2.0 to PCIe)
2. **Storage Interface**
   - QSFP PCIe2.0 x4 lanes. 4 ports
   - Support ExaSAN A12S2, B08S3, A08S3, A16S3
3. **Supports most main-stream SAN management software**
   - Support cross-platform SAN management software to build up a MDC for PCIe SAN environment
   - Support most main-stream SAN management like SANit, MetaSAN, Xsan, Fibrejet and etc…
4. **Management**
   - Web-based GUI, cross-platform executable
   - Monitor and control via Web GUI of enclosure components
   - LED indicators for enclosure status
   - Event log download from Web GUI
   - Supports both in-band and out-band management
   - Supports RAID management by EFI and BIOS
   - Supports firmware upgrade via GUI
   - Supports SNMP
   - Supports remote management
5. **Enclosure**
   - FAN, Power, Temperature status LED indication in the front faceplate.
   - Dimensions: 43.8mm(H) x 447mm(W) x 410mm(L)
   - Weight : 6.9 Kg(15.21 lb)
6. **Supported OS**
   - Windows 7, 8, 2008 and 2012 (32/64bit)
   - Linux: Red Hat, SUSE, Fedora, CentOS, etc.
   - MAC: OS X(10.5, 10.6, 10.7, 10.8, 10.9 and later)

7. Operating Conditions

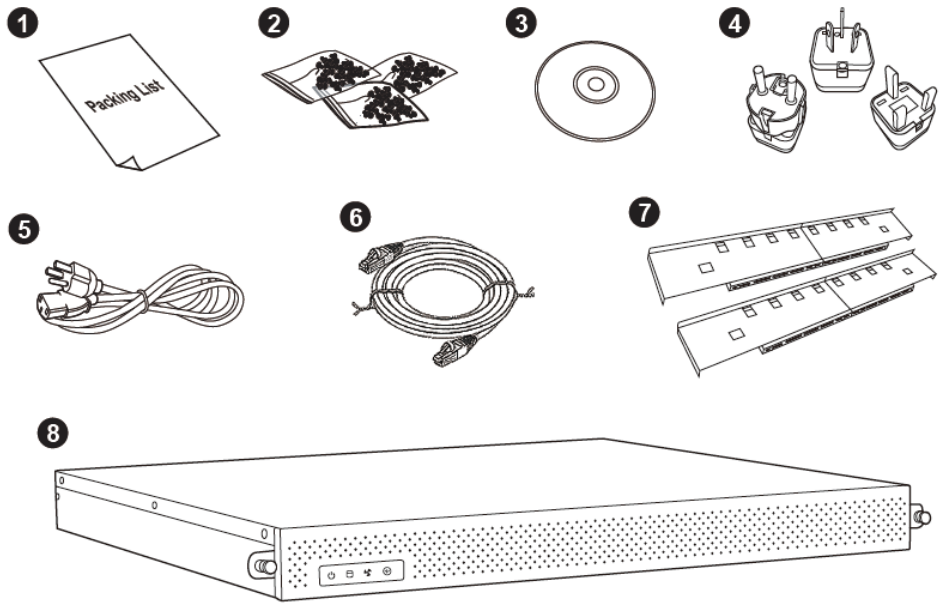
- Humidity: 5% - 85%
- Operating Temperature: 0degC – 40degC
- Certification: RoHS, UL, CE, FCC, C-Tick, BSMI

8. QSFP Cable

- Copper cable:2M (standard)
- Optical cable:10M, 30M, 50M and100M (optional)

1.2 What's in the Box

Your ExaSAN A16S3-PS is shipped in special packaging to provide protection during transportation. Carefully check your carton contents against the included packing list, or the inside flap of the box, and your original purchase order. You should have the items as described in the sections below.



SW16 packing list

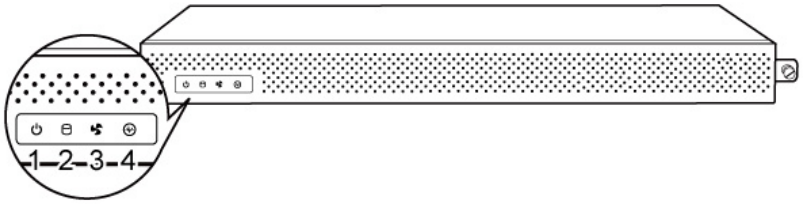
1. Packing list (x1)
2. Screw pack (x3)
3. ExaSAN installation DVD (x1)
4. Power converter UK, EU, AU to US (x6)
5. AC power cord (x2)
6. Ethernet cable (x2)
7. Rail set (x1)

1.3 Your SW16 at a Glance

This section helps you get familiar with the physical appearance of your ExaSAN SW16

1.3.1 ExaSAN SW16

1.3.1.1 SW16 Front Panel

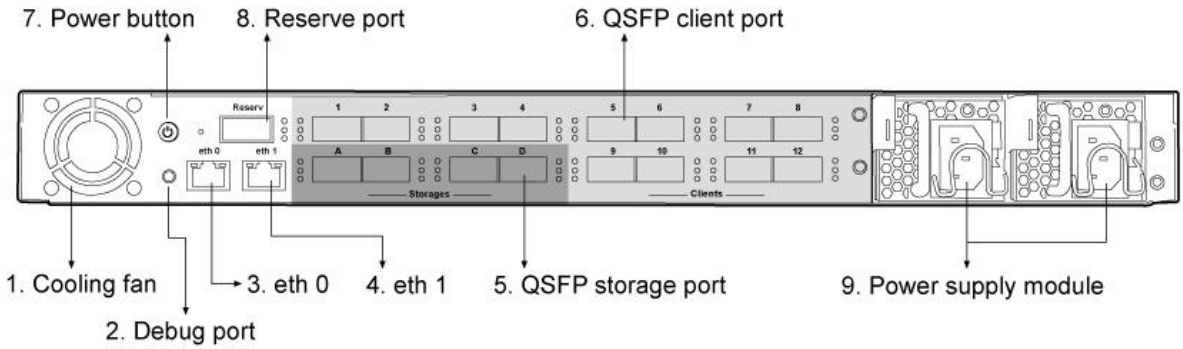


Item	Name	Color	Description
1	System Power	Blue	**Flashing Blue** indicates the host is booting. **Solid Blue** indicates the subsystem power supplies are working normally.
2	Access Status	Blue	**Flashing Blue** indicates the host is accessing.
3	Hardware Status	Blue/Red	**Solid Blue** indicates the hardware included fan, power supply are working normally. **Solid Red** indicates some hardware failed, check fan, power supply.
4	Controller Status	Blue	**Flashing Blue** indicates the controller is booting for link **Solid Blue** indicates the controller is ready for link to a client.

1.3.1.2 Beeper Codes

Controller Status	Beeper mode
Power on the switch	One short beep followed by three beeps
Power off the switch	Five short beeps
System kernel Panic	Continuous beeping
Fan Failure	Three short beeps (Repeating)
Fan speed is under 5500RPM	Three short beeps (Repeating)
Power Failure	Three short beeps (Repeating)
Temperature Failure	Three short beeps (Repeating)

1.3.1.3 SW16 Rear Panel

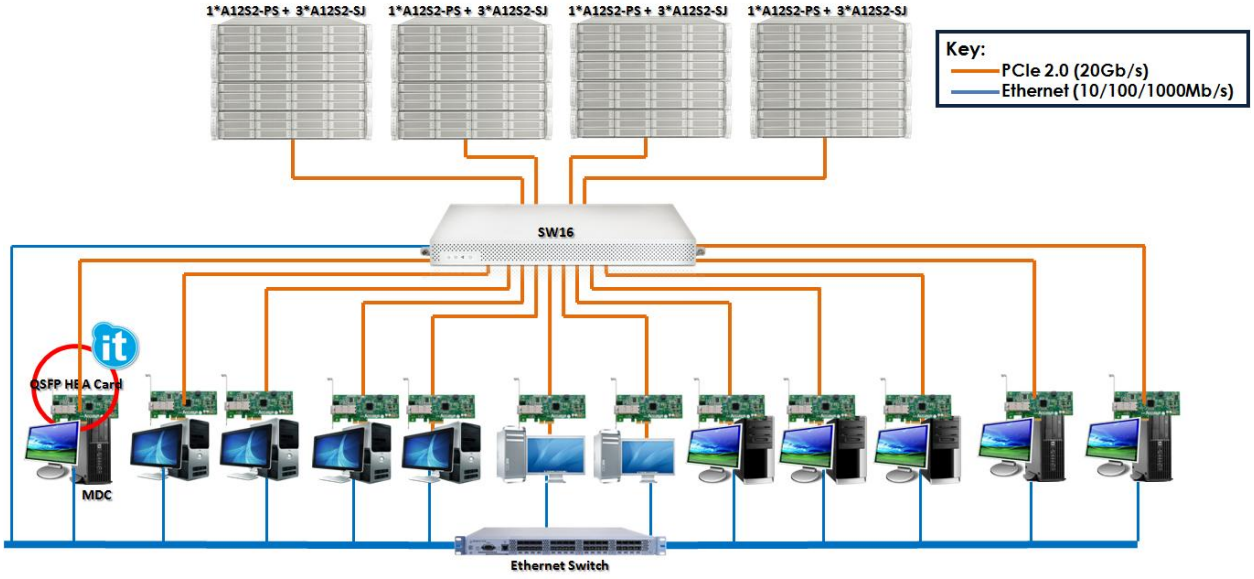


No.	Name	Description
1	Cooling fan	Prevents the switch from overheating.
2	Debug port	For engineer debugging.
3	eth0 Ethernet port (Management Port)	Controls webGUI of the SW16 through this port. The default IP is “192.168.0.25”
4	eth1 Ethernet port (SAN Private Port)	For MDC private port, default IP is “192.168.1.25” (this port doesn’t support DNS function.)
5	QSFP storage port	Access LED (top): • **Flashing Blue** indicates storage accessing is in progress. Link LED (middle): • **Solid Green** indicates the controller is connected normally. • **Flashing Green** indicates the controller has degraded to PCIe1.1 Fail LED (bottom): • **Solid Red** indicates the port is connected to a client (wrong connection type).
6	QSFP client port	Access LED (top): • **Flashing Blue** indicates storage accessing is in progress. Link LED (middle):

		• **Solid Green** indicates the controller is connected normally. • **Flashing Green** indicates the controller downgrade to less lanes of PCIe • **No light** indicates “no power” or “no connection” to the ExaSAN storage. Fail LED (bottom): • **Solid Red** indicates the port is connected to a client (wrong connection type).
7	Power button	• Click once to switch on/off the power. • Push the button for 5 seconds to force shut down the power immediately.
8	Reset hole	If you want to reset the all setting of the switch, you could use a needle or pin to push into the hold for ***13 seconds***. Then you’ll hear two short beeps and the switch will restart. All settings would go back to default. ***Caution:*** *If you push reset hole but are still connected to the clients, you might damage important data in the SAN.*
9	Reserve port	This QSFP port is reserved.
10	Power supply module	Connects to independent power sources for fault tolerance.

1.4 Plan a SAN

To plan a suitable SAN, you have to well know the requirements of all, make a topology chart will more clearly and help to prepare all components of SAN, following is a sample chart of SAN environment.



Please contact to your reseller for support, or fill out the form by below link and send to Accusys support for consult.
http://www2.accusys.com.tw/Download/Download.aspx?Dir=D%3a%5cDownload+%26+Upload%5cPartner_Public%5cMarketing+Materials%5cTemp%5cExaSAN+-+SAN+Pre-Sales+Registration+Form.docx

1.5 What Else You Need

When you purchased your ExaSAN system, additional hardware, software and accessories may be required to fully take advantage of this system. The following describes the software and hardware which you may need to purchase separately. If you still have questions, please consult with your ExaSAN reseller for more details.

1. **SAN software:** To manage data read/write shared storage from multiple clients, SAN software is a necessary for data protection from damage. SW16 support almost all famous SAN software, e.g. Tiger store, metaSAN, Xsan, Stornext. Please contact to manufacturer for proper installation.

2. **Host computer with ExaSAN HBA:** Host workstation or server with an available PCIe2.0 x4(for Z1M-G2) or PCIe3.0 x8 (for Z2M-G3) slot to install the ExaSAN HBA.

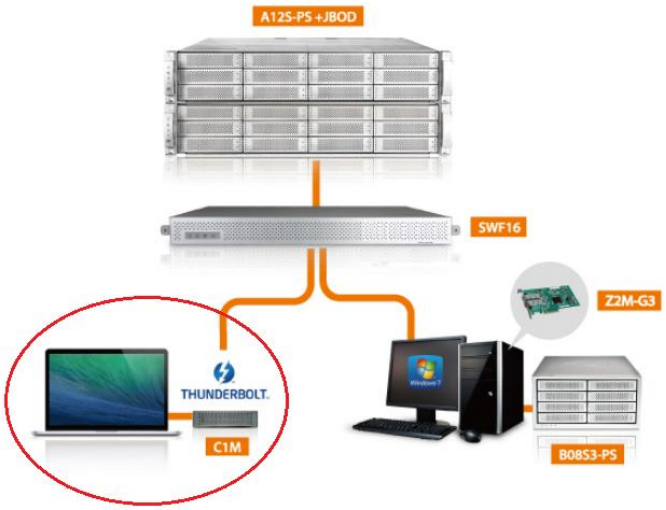
> **Note**
> Accusys cannot guarantee ExaSAN product compatibility with all workstations and motherboards on the market, so please check with your supplier before installation.

3. **ExaSAN RAID system:** Support both ExaSAN PCIe2.0/3.0 product, confirm with reseller and on Accusys website if any update.

4. **ExaSAN Software:** Driver, GUI and Firmware files for SW16 are all included in the DVD inside the package. Also, you can download all of it from the website (http://www.accusys.com.tw/support/download.html), directory is /ExaSAN/ForSAN/{switch}

> **Note**
> GUI software "RAIDGuard X" is Java based tool, which using for manage and monitor ExaSAN RAID system. Refer to RAID system manual guide for detail information.

5. **Thunderbolt Convertor - C1M (optional):** If you have host client need to connect via Thunderbolt port, you may need a C1M (http://www.accusys.com.tw/products/accessories/c1m-new.html) to convert Thunderbolt to PCIe, shows as below connection.



2. Preparing to Install ExaSAN SW16

2. Preparing to Install ExaSAN SW16

To ensure safe and smooth operation of your ExaSAN SW16, it is essential that you choose an appropriate location for the system, and provide an appropriate operating environment and adequate power for all components of the system. As you plan for installation, follow the guidelines below to ensure that the system and its environment are safely and appropriately positioned for efficient operation and service.

2.1 Precaution for Handling the System

Take the following precautions to avoid damage to the system or potential injury to you.

1. Prepare a flat, sturdy surface before removing the system from its packaging. The table or cart that will hold the system should be as close as possible to the system's carton.
2. Ensure that all power switches have been turned off and all power cords disconnected to prevent personal injury and damage to the hardware.
3. Static electricity can damage electronic components of your system. Follow the guidelines below to avoid such damage:
    a. Work in a static-free environment
    b. Wear a grounded anti-static wrist strap
    c. Store uninstalled components in anti-static bags
    d. Handle circuit boards by their edges and avoid touching chips and connectors

2.2 Choosing the Location for the System

The ExaSAN SW16 is designed as a rack-mount solution. Depending on where your rack is located, you should keep the following points in mind when determining where to place your system.

1. Measure the amount of available space in the rack. The amount of space required for the SW16 is 1U rack space. (dimensions are L410mm x W447/480.2mm x H43.8mm)
2. Measure the distance between any two components that need to be connected via cable(s). This measurement will help you determine the length of the required cable(s). Or if you've already purchased the cables, determine the proximity of the components in question.
3. Leave sufficient room, at least two inches, around the unit to allow air ventilation.
4. Do not block or cover any of the ventilation holes in the front and back panels of the unit. Consistent airflow is essential to keeping the system operating efficiently.
5. Allow additional room at the front and back of the unit for service.
6. The ExaSAN SW16 uses several cables and cords. It's a good idea to determine how they will be arranged at the rear of the system, and where the cables will be routed to connect to the host systems and RAID disk systems.

2.3 Electrical Power

At your chosen location for the ExaSAN SW16, make sure that the electrical circuitry and power outlets are sufficient for the combined power needs of all hardware components. To plan for safe and adequate power to the system, follow these guidelines:

1. Check the documentation for all hardware components at the chosen location to determine their power requirements. Then make sure that the available power supply for that location is sufficient for the planned components.
2. If you need assistance determining the power needs of the components at the chosen location, consult an electrical expert who is familiar with your facility.
3. When possible use surge protectors or power conditioners as part of the installation.

4. When planning for electrical power, make sure you have more power than the total power requirements specified for all components. Also make certain that the power load is distributed evenly among circuits to that location. Consult an electrician or other expert if you need assistance with planning for the power needs of your components.
5. When possible, plug the redundant power supplies onto different circuits.
6. Make sure that the power outlets for all hardware components are grounded according to local and national standards. Consult an electrician if you need assistance with grounding.

2.4 Operating Environment

The operating environment for the ExaSAN SW16 must meet certain requirements:

1. Verify that the temperature range of the chosen location is within the limits established for the system and all other components.
2. Make certain that the chosen location has adequate ventilation to maintain the necessary temperature range.
3. If there are multiple hardware components installed at the chosen location, consider additional cooling measures to assure efficient operation of the system and other components.
4. Environment parameters:
    a. Operating temperature: 0°C to 40°C (32°F to 104°F)
    b. Non-operating temperature: -40°C to 70°C (-40°F to 158°F)
    c. Operating humidity: 5-85%, non-condensing
    d. Storage humidity: 0-95%, non-condensing

2.5 Security

To ensure the security of the ExaSAN SW16, make certain that the chosen location meets your security requirements.

3. Installing the ExaSAN SW16

3. Installing the ExaSAN SW16

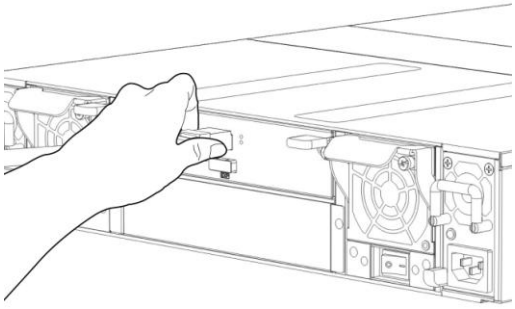
Follow the steps in this chapter to prepare your ExaSAN SW16 for installation.

3.1 Hardware installation

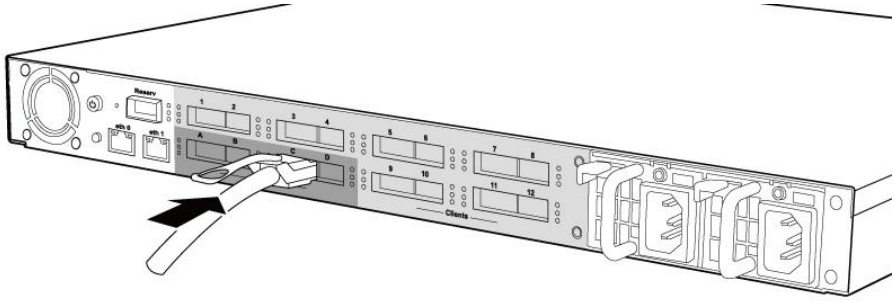
Follow the instructions in this section to hook up all your hardware components of the ExaSAN SW16, Do not turn the power of any individual component on until instructed. When all components are properly connected, follow the instructions in section 3.2.1 “Powering On” to turn the components on in the prescribed order.

3.1.1 Installing ExaSAN RAID system to storage port

1. Using QSFP cable to connect ExaSAN storage into the storage port on the rear panel of the ExaSAN switch.



Connecting QSFP cable to A12S2-PS



Connecting the QSFP cable to the storage port (black color)

Note
Your cable connector is securely plugged when you hear a “click” If you do not hear or sense a click, please re-insert the QSFP connector.

If you need to unplug the cable, pull the ring on the connector firmly until it is detached from the port.

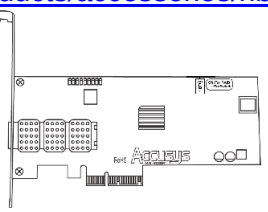
QSFP connection is not support Hot Plug. Please be sure to offline plug QSFP cable.

2. Connect power cord into the AC power in the storage system; do not turn power on yet.

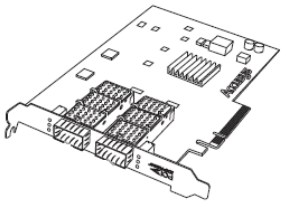
3.1.2 Installing Host to Client port

1. Install HBA or convertor to host, then connecting QSFP cable into SAN port (or SAN mode) you may have few configurations as below;

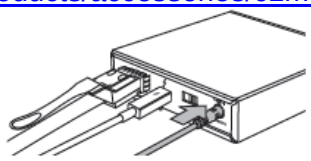
   a. Host with Z1M-G2, refer to manual guide by below link:
   http://www.accusys.com.tw/products/accessories/hba-cable/document.html



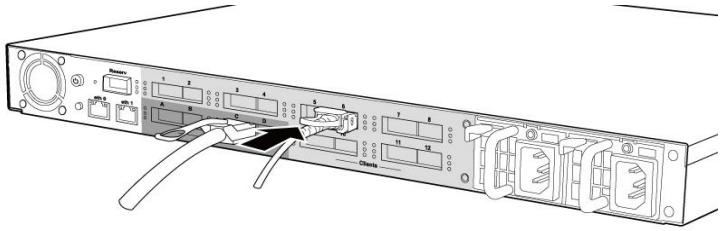
   b. Host with Z2M-G3, refer to manual guide by below link:
   http://www.accusys.com.tw/products/accessories/hba-cable/document.html



   c. Host with C1M-G2, refer to manual guide by below link:
   http://www.accusys.com.tw/products/accessories/c1m-new/document.html



2. Insert the other end QSFP connector to the Host port of rear of switch.

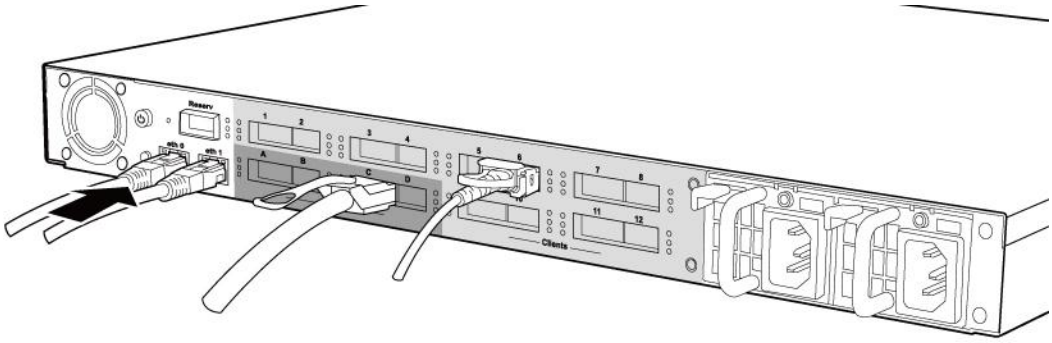


Note

- Refer to manual guide to setup HBA/Convertor to **SAN port (or SAN mode)**, if setup to DAS port (or DAS mode), storage will not be recognized.
- PCIe slots on some motherboards are for graphics cards only. Check with the motherboard vendor for compatibility.

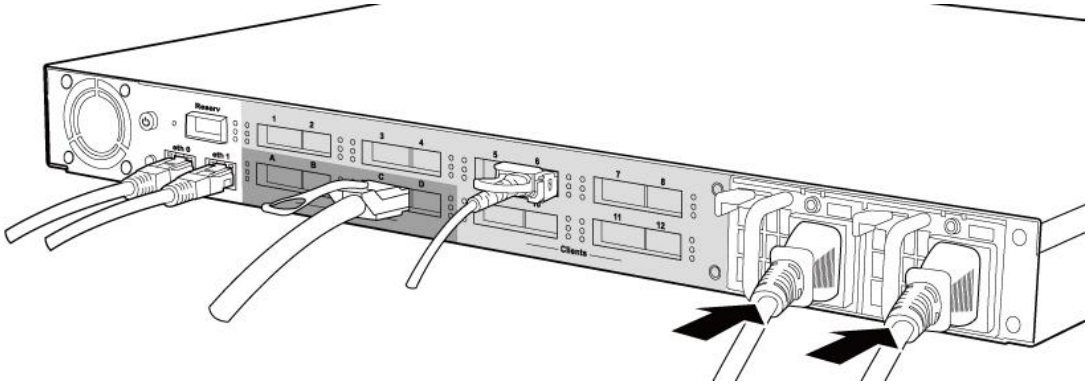
3.1.3 Connecting to LAN port and power cord

1. Insert the Ethernet cable into eth0 (management port) and eth1 (private port for MDC) on the SW16. The default IP addresses are 192.168.0.25 and 192.168.1.25., respectively.



Connecting the Ethernet cable to eth0 and eth1

2. Connect the power cords to the both power supply modules.



Connecting the power cords to the power supply module

3.2 Powering the System On and Off

3.2.1 Powering On

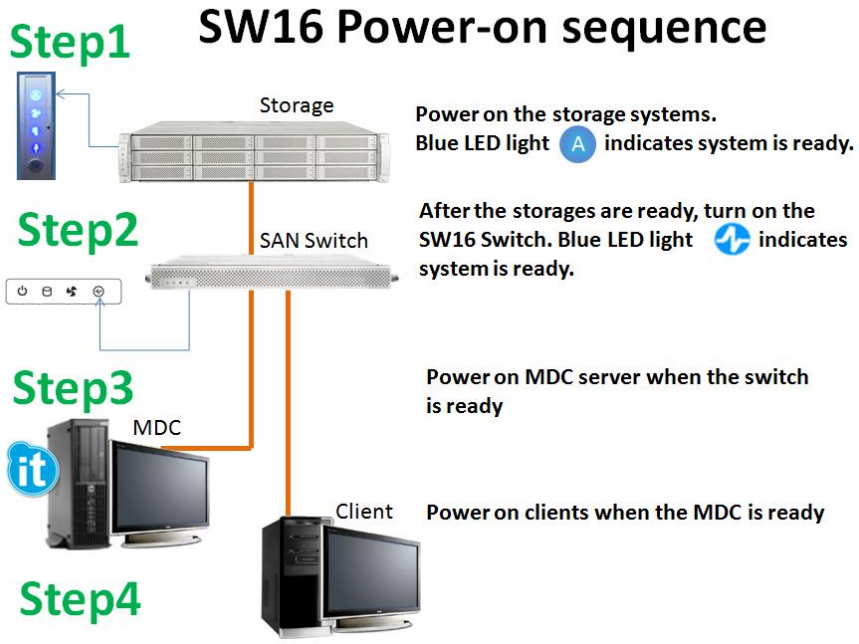
Before powering on, make sure that all QSFP cables and power cords are properly installed and connected, following steps is procedure to power on SAN;

Step1. Power on all RAID systems (if there is JBOD connected, power on JBOD then RAID system) sounds a short beep to ready, refer to RAID system usual guide for more detail.

Step2. Power on ExaSAN switch, click power button and waiting for few minutes, sounds 3 short beeps to ready.

Step3. Power on SAN MDC server

Step4. Power on SAN client workstation.


SW16 Power-on sequence
Step1
Storage
Power on the storage systems.
Blue LED light A indicates system is ready.
Step2
SAN Switch
After the storages are ready, turn on the SW16 Switch. Blue LED light indicates system is ready.
Step3
MDC
Power on MDC server when the switch is ready
Client
Power on clients when the MDC is ready
Step4

Caution

- It is important to follow the correct Power On sequence. Failure to do so may result in some features not functioning properly.
- Refer to SAN software manual guide if any specific steps to power on all hosts, or data might be damaged.
- QSFP connection is NOT support Hot Plug, shutdown all devices and back from Step1 to Step4 if any failure happen.
- Thunderbolt connection support Hot Plug.

3.2.2 Powering Off

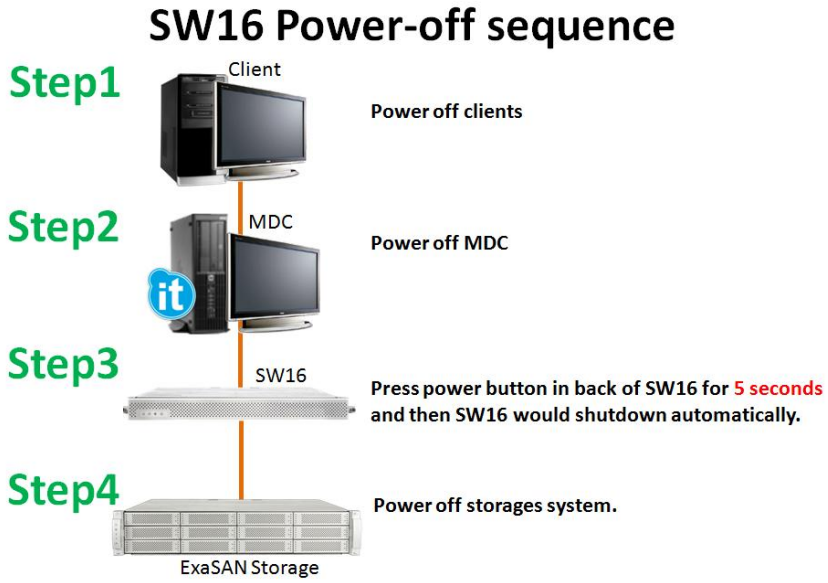
If you need to power off the SAN, such as when switch or RAID system requires firmware updates, adding a RAID system or client computer, power off in the reverse order of Powering On.

Step1. Power off SAN client workstation.

Step2. Power off SAN MDC server

Step3. Power off ExaSAN switch, click power button will sounds 5 short beeps, waiting for few seconds, power will down automatically.

Step4. Power off all RAID systems (if there is JBOD connected, power off RAID then JBOD)



3.3 Installing Driver and RAIDGuard X

Before installing driver and GUI, make sure all connections and power on sequences are all correct.

RAIDGuard X is a Java based GUI for managing and monitoring RAID controller, refer to Appendix B RAIDGuard X introduction for more detail.

Installation files can be found in DVD of accessory, you can also download the latest version from our website if necessary, check the website if any new version (http://www.accusys.com.tw/support/download.html).

Note

- For Mac/Windows platform:
  Executing installer package to install driver and GUI at the same time.

- For Linux platform:
  Driver and GUI must be built in kernel and executed separately.

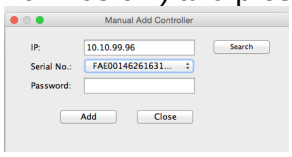
3.3.1 Installing on MAC and Windows

1. Looking for installer package in the DVD and double click to execute;
   - For Mac, execute “/MAC Installer/Vx.x/Accusys_IP_MAC.mpkg".
   - For Windows, execute “/Windows installer/Vx.x/Accusys_Win.exe”.

2. Follow the onscreen instructions to install and click **Restart** to complete installation.

3. Find the RAIDGuard X Client icon , double click to open console.

4. Drop in **controlle**r tab, click **Manually Add Controller**. Key in switch IP address (default is 192.168.0.1) and press **Search** to browse RAID controller connected on switch.



Note
All connected RAID controller’s serial number will appear on **Serial No** column, key in password (default is 00000000, eight zero) and press **Add** to add controller one by one.

3.3.2 Installing on Linux

3.3.2.1 Driver Installation

You must have your Linux system with developmental environment and kernel source, in other words you should select the adequate packages on the menu list during installation. Check “Development Tools” Then click “Optional Packages” to select all packages when you install your Linux OS.

1. Login as **Root** account.
2. Find out the Linux driver files and copy onto your desktop, for example, saving drive files on /Desktop/Linux_Drv_x.x.x directory.
3. Open a terminal window, change to the driver directory and use **make** command to build ExaSAN driver file.

   # cd /Desktop/Linux_Drv_x.x.x
   # make

4. Use **ls** command to verify that driver file **ACS6x.ko** has been compiled.

   # ls

```
[root@localhost Linux_Drv_3.1.8]# ls
ACS6x.ko     acs_ame.h  ame.h         AME_Queue.c  AME_Raid.o      MPIO.c
ACS6x.mod.c  acs_ame.o  AME_import.h  AME_Queue.h  built-in.o      MPIO.h
ACS6x.mod.o  ACS_MSG.c  AME_module.c  AME_Queue.o  Makefile        MPIO.o
ACS6x.o      ACS_MSG.h  AME_module.h  AME_Raid.c   Module.markers  OS_Define.h
acs_ame.c    ACS_MSG.o  AME_module.o  AME_Raid.h   Module.symvers
```

5. Use **insmod** command to install driver and **lsmod** command to check if it’s running.

   # insmod ACS6x.ko

 # lsmod

Note
Login as **root** account, or make driver will result in fail.

6. Copy the compiled driver (ACS6x.ko) to driver directory of linux.

   #cp ACS6x.ko /lib/modules/ "uname –r"/kernel/drivers/scsi

7. For RHEL, CentOS, use **depmod** command to make driver auto-loaded in boot up.

   #depmod –a

8. For SLES, follow the steps below to make driver auto-loaded in boot up.

   #vi /etc/modprobe.d/unsupported-modules
   Find the line "allow_unsupported_modules 0" and modify the value from 0 to 1.

   #mkinitrd
   #reboot

Caution
Strongly recommend to backup **/boot/initrd-`uname -r`** before performing **mkinitrd**, in order to restore back from any trouble.

3.3.2.2 RAIDGuardX Installation

Before installing RAIDGuard X, make sure the RAID HBA drivers is already installed in your Linux OS.

1. Find out GC (RAIDGuardX Client) in DVD or download from Accusys website: http://www.accusys.com.tw/support/download.html.
   GC location: /ForSAN/{switch model}/GUI/Client/x.x.x.zip

2. Unzip files to a particular directory, for example /Accusys/GC.
3.
4. GC is running with Java, which version must higher than 1.6, enter the following commands:

 # java –version

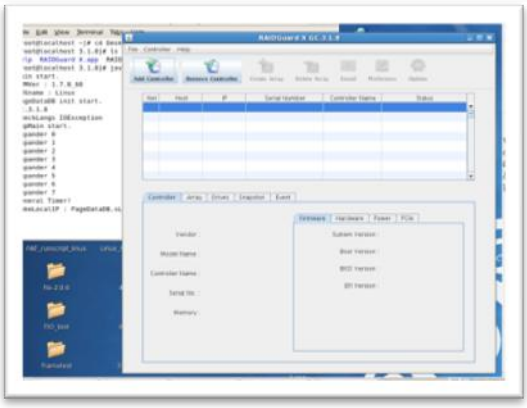
```
[root@localhost ~]# java -version
java version "1.6.0_14"
Java(TM) SE Runtime Environment (build 1.6.0_14-b08)
Java HotSpot(TM) Client VM (build 14.0-b16, mixed mode, sharing)
[root@localhost ~]#
```

If your Java version is earlier than 1.6, please go to www.java.com to upgrade.

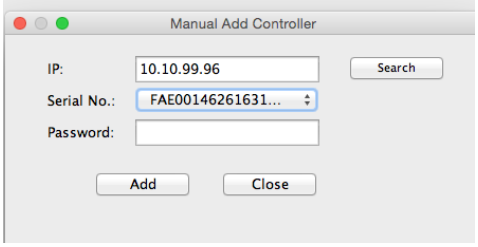
5. Use **java** command to open GC console.

 # cd /Accusys/GC/x.x.x./x.x.x/
 # java –jar RAIDGuardX.jar

```
root@localhost ~]# cd Desktop/Accusy/GC/3.1.8/3.1.8/
root@localhost 3.1.8]# ls
Help  RAIDGuard X.app  RAIDGuardX.jar
root@localhost 3.1.8]# java -jar RAIDGuardX.jar
```



6. Drop in **controlle**r tab, click **Manually Add Controller**. Key in switch IP address (default is 192.168.0.1) and press **Search** to browse RAID controller connected on switch.



Note
All connected RAID controller's serial number will appear on **Serial No** column, key in password (default is 00000000, eight zero) and press **Add** to add controller one by one.

3.3.3 Confirming ExaSAN driver on OS

Here provides the way to check driver status on MacOS and Windows. If you want to check on Linux platform, please providing completed Linux kernel version and mail to technical support for help.

3.3.3.1 Confirming on MacOS

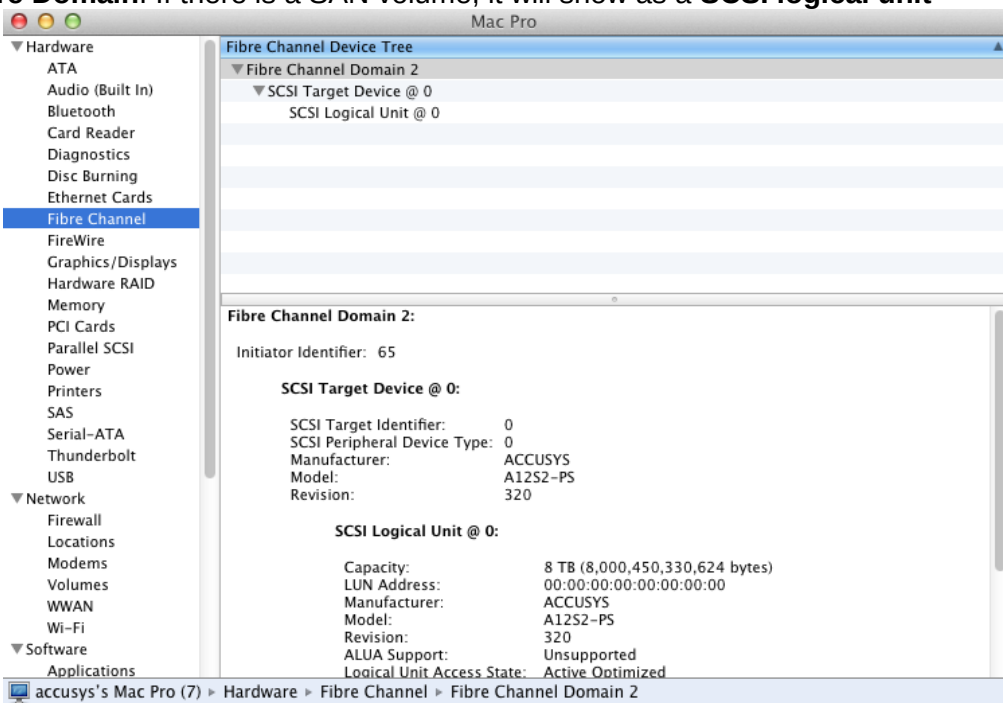
After installing the ExaSAN RAID system HBA driver on the Mac host server, confirm the driver has been properly installed with the following steps.

1. Click on **About This Mac** and lick on the **More Info…** button, then Click on the **System Report…** button.

About This Mac
Mac OS X
Version 10.7.1
Software Update...
Processor 2 x 2.8 GHz Quad-Core Intel Xeon
Memory 4 GB 667 MHz DDR2 FB-DIMM
Startup Disk Mac OS X 10.7
More Info...

About This Mac
Overview Displays Storage Memory
Support Service
Mac Pro
Early 2008
Processor 2 x 2.8 GHz Quad-Core Intel Xeon
Memory 4 GB 667 MHz ECC DDR2 FB-DIMM
Graphics NVIDIA GeForce GT 120 512 MB
Serial Number G88163YYXYK
Software Mac OS X Lion 10.7.1 (11B26)
System Report...
3 Software Updates...

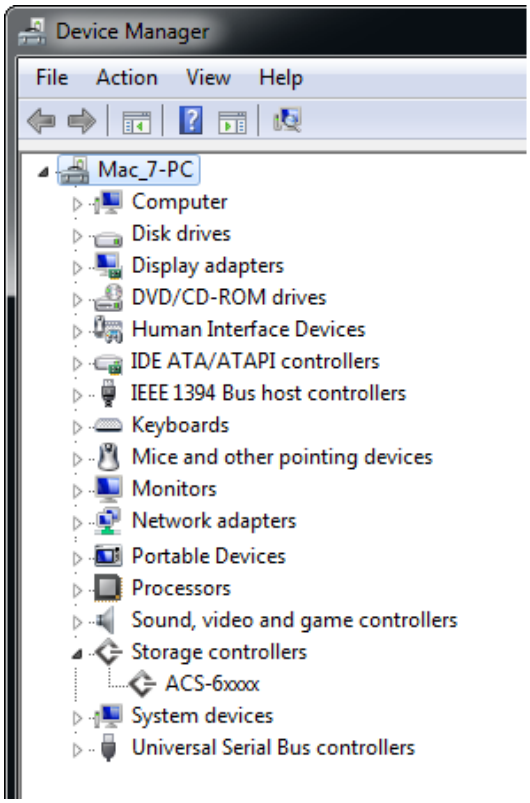
2. MacOS recognize ExaSAN as Fibre device, under the **Hardware** category, click on **Fibre Channel** to bring up information. If HBA (or C1M) has been correctly installed, it will appear a **Fibre Domain**. If there is a SAN volume, it will show as a **SCSI logical unit**



3.3.3.2 Confirming on Windows

After installing the ExaSAN RAID system HBA driver on a Windows based host server, confirm the driver has been properly installed.

Go to **Control Panel -> System Properties -> Hardware -> Device Manager** (depending on the version of Windows, the path may vary). If the driver has been correctly installed, the HBA is listed with the **ACS-6xxxx** identifier (actual name may vary) as **Storage Controllers**.



Caution
If you see the HBA listed as an unknown device under Windows, follow the driver installation steps to reinstall the driver. If you do not see the HBA under Device Manager, Windows does not detect the card. Power off the host server to reseat the HBA.

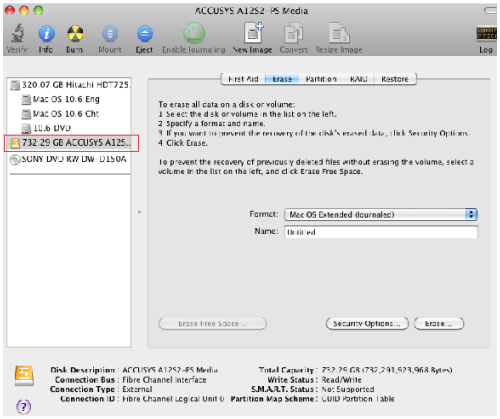
3.3.4 Confirming LED of HBA

Verify the LED indicators on the HBA are appropriately lit according to your installation, refer to corresponding manual guide for detail information. (Appendix A: FAQ-Q3 describes how to check the Link status of internal and external PCIe connection.)

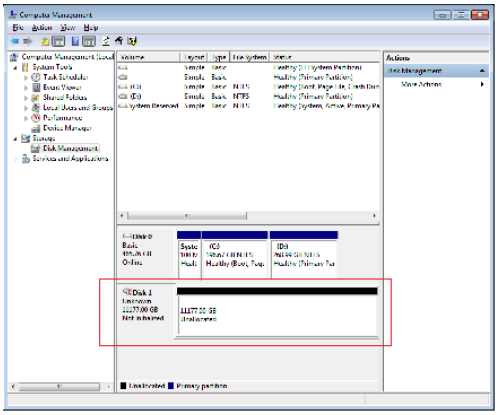
3.4 Create Array

Array can be created by RAIDGuard X (Appendix B – Create an Array) or switch webGUI (section 4.2 Quick Setup). Make sure LUN mapping (Appendix B - LUN mapping) is setup, and then volume should be appeared on OS, now, enjoy the high speed access to new ExaSAN Volume.

3.4.1 Check on new Volume in Disk Utility of MacOS

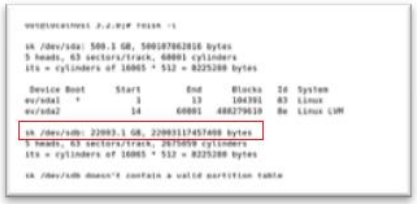


3.4.2 Check on new volume in Disk Management of Windows



3.4.3 Check on new volume by fdisk command on Linux

fdisk -l



4. Using ExaSAN switch web GUI

4. Using Switch Web GUI

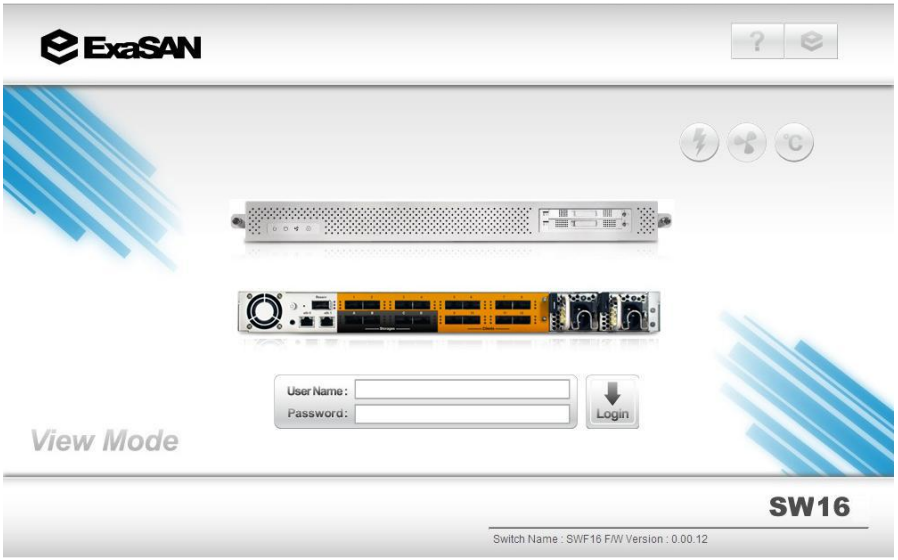
After you have connected all your ExaSAN components, powered the system on, and used a web browser in a computer, which is in the same network, we will first need to perform some basic configuration and setup before the ExaSAN SAN environment is fully operational.

> **Note**
> The default IP of eth0 is 192.168.0.25 and eth1 is 192.168.1.25.

4.1 ExaSAN switch web GUI

4.1.1 Entering ExaSAN switch web GUI

After you type the IP address “192.168.0.25” on your web browser to enter the main page of the web GUI as following screen shot, it might ask you to install the JAVA script. Please follow the steps shown on the screen to complete the installation. Then you can see the following screen shot.

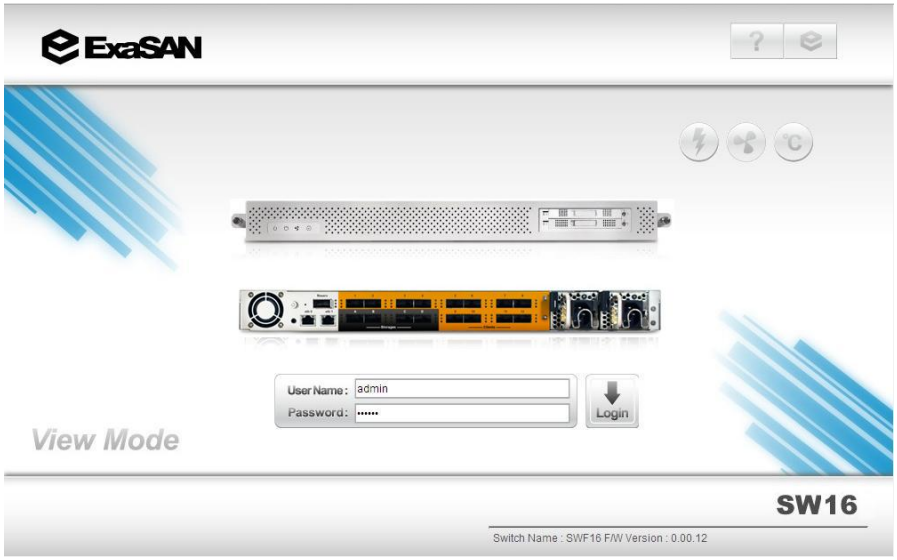


4.1.2 User name and Password

The default user name and password is “admin” and “00000000” (8 zeros). Please type the user name and password to enter the configuration menu of the web GUI as the following figure.

> **Note**
>
> User cannot change the default user name but password. If you forget your changed password, you could push the reset button in back of the SW16 for 13 seconds to go back the default setting. Please refer to the section 1.4.1.4 for more detailed info.

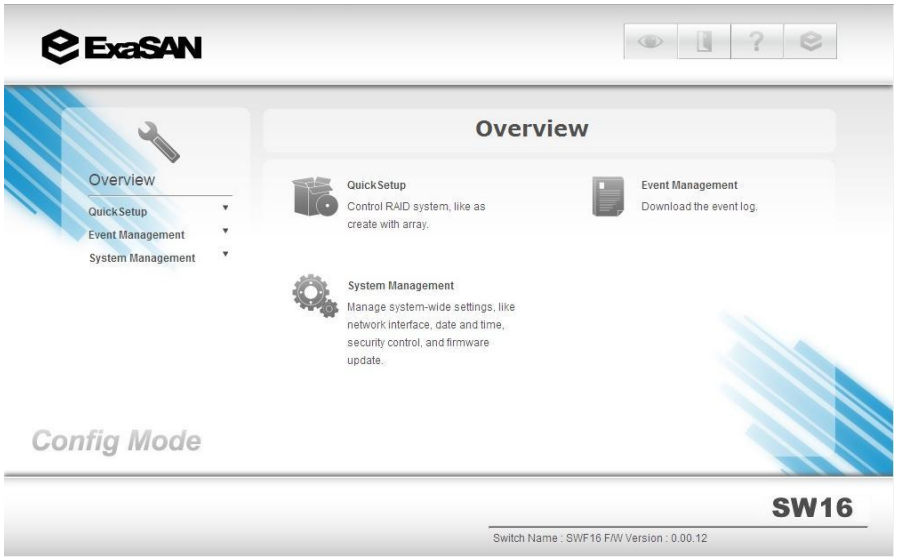
Caution:
If you push reset hold but not disconnected the all clients, you might damage your important data in the SAN environment.



4.1.3 Configuration menu - Overview

The following Figure is shown the three main functions,

- Quick Setup
- Event Management
- System management
- Application

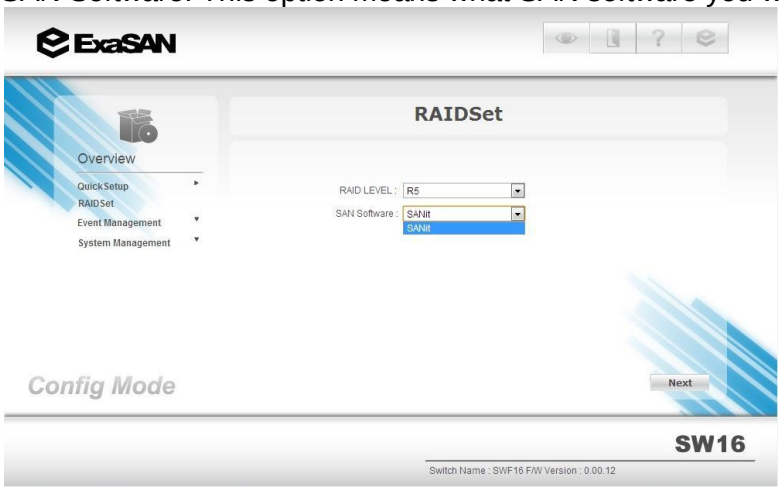


4.2 Quick Setup

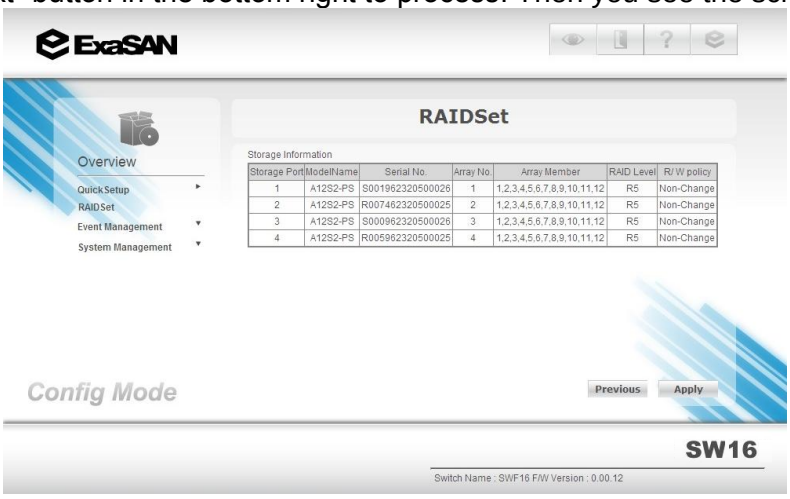
If you haven't created arrays in your ExaSAN storages that have been connected with SW16, you could create arrays in the ExaSAN storages by "Quick Setup" function as following screen.

> **Note**
> Quick Setup function just creates arrays for RAID systems, but not JBOD.

Step 1: Choosing RAID level. You can choose R5 or R6 in the menu.
Step 2: Choosing SAN Software. This option means what SAN software you want to use.



Step 3: Click "Next" button in the bottom right to process. Then you see the screen as following.


ExaSAN
RAIDSet
Overview
Quick Setup
RAIDSet
Event Management
System Management
Storage Information
Storage Port | ModelName | Serial No. | Array No. | Array Member | RAID Level | R/ W policy
1 | A12S2-PS | S001962320500026 | 1 | 1,2,3,4,5,6,7,8,9,10,11,12 | R5 | Non-Change
2 | A12S2-PS | R007462320500025 | 2 | 1,2,3,4,5,6,7,8,9,10,11,12 | R5 | Non-Change
3 | A12S2-PS | S000962320500026 | 3 | 1,2,3,4,5,6,7,8,9,10,11,12 | R5 | Non-Change
4 | A12S2-PS | R005962320500025 | 4 | 1,2,3,4,5,6,7,8,9,10,11,12 | R5 | Non-Change
Config Mode
Previous
Apply
SW16
Switch Name : SWF16 F/W Version : 0.00.12

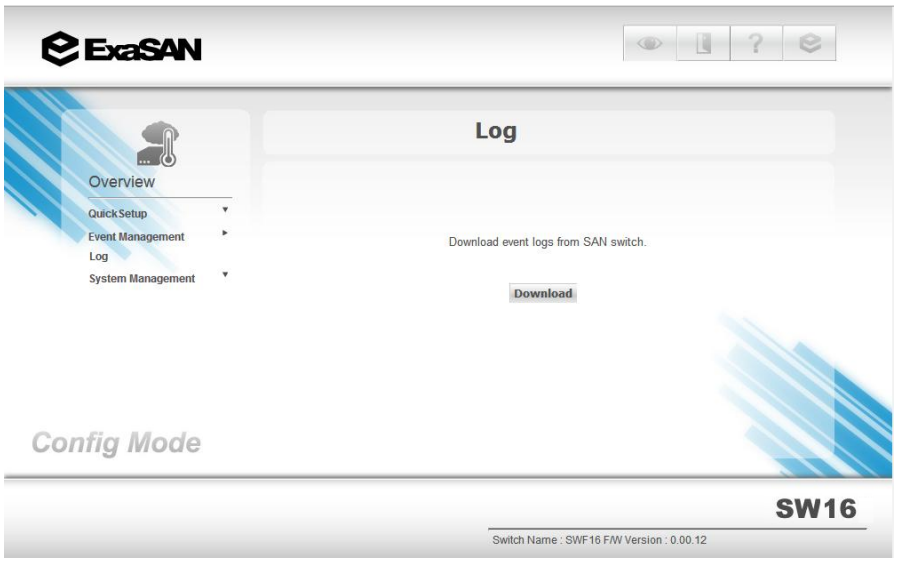
Step4: If the Storage Information is correct, please click "Apply" button to start arrays creating.

> **Note**
> We strongly recommend you creating 2, 4 or 8 arrays to build up your SAN volume because of the performance issue.

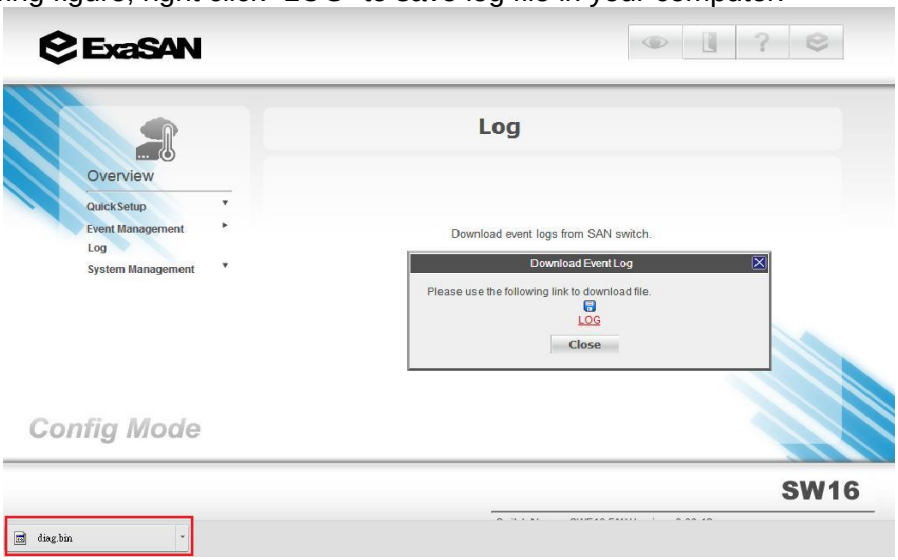
4.3 Event Management

Log is the very important clue to analyze root caused when user meet some problem around the SAN environment. SW16 web GUI provides the function to download the log of the SW16.

Step 1: To click “Event Management”, then clicking “Download” button to process.



Step 2: After the processing finished, you can see the log hyper-link in the middle as the following figure, right click “LOG” to save log file in your computer.



4.4 System Management

There are several functions in “System Management”. It includes

- Network
- Time
- Security Control
- Firmware Update
- Restart/Halt

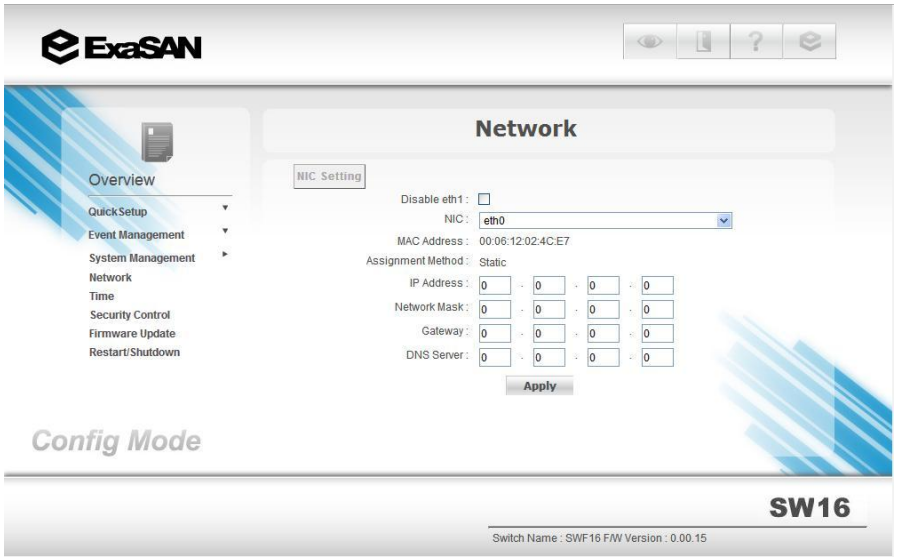
4.4.1 Configuring the network – “Network”

Users can use “NIC” option to choose “eth0” or “eth1” and then setup the parameters. We strongly recommend using eth0 as public network for communicating with other computer, which is not in the ExaSAN SAN environment and eth1 as private network for ExaSAN SAN environment.

4.4.1.1 eth0 – SAN management port (RJ45)

Users can find the following info or setup the parameters in the page

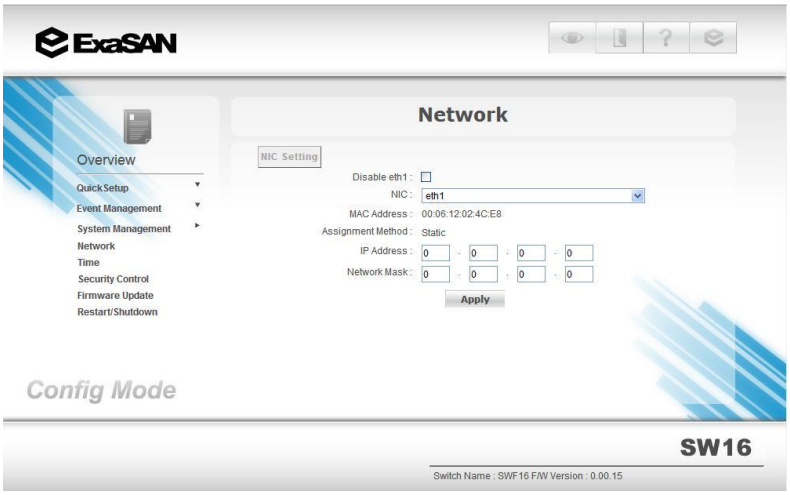
- Disable “eth0”: Checking the box in front of “Disable eth0” to disable eth0 port.
- MAC address: User can find the MAC address of eth0 in the page
- Assignment method: To setup or change the IP of eth0. The default IP address is “192.168.0.25”.
  - IP address
  - Network Mask
  - Gateway
  - DNS server



4.4.1.2 eth1 – SAN private port (RJ45)

Users can find the following info or setup the parameters in the page

- Disable “eth1”: Checking the box in front of “Disable eth1” to disable eth1 port.
- MAC address: User can find the MAC address of eth1 in the page
- Assignment method: To setup or change the IP of eth1. The default IP address is “192.168.1.25”.
  - IP address
  - Network Mask



4.4.2 Changing SW16 time – “Time”

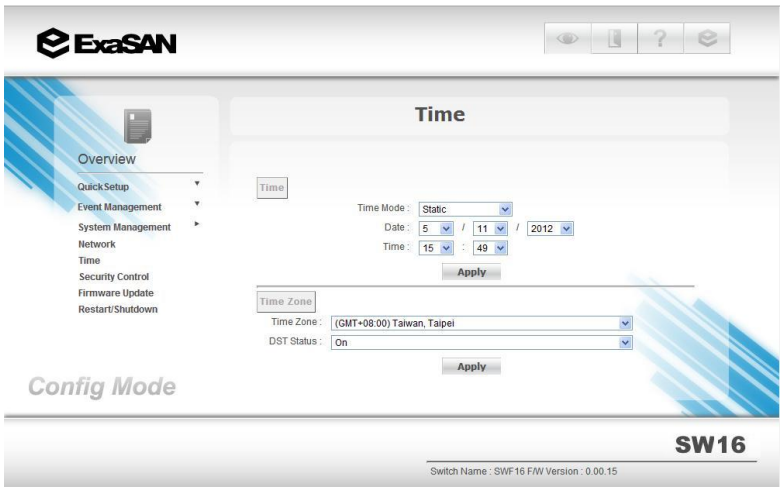
ExaSAN switch web GUI support 2 types of time setting.

- Static
- NTP

Time setting would affect the time that record in event log of the SW16.

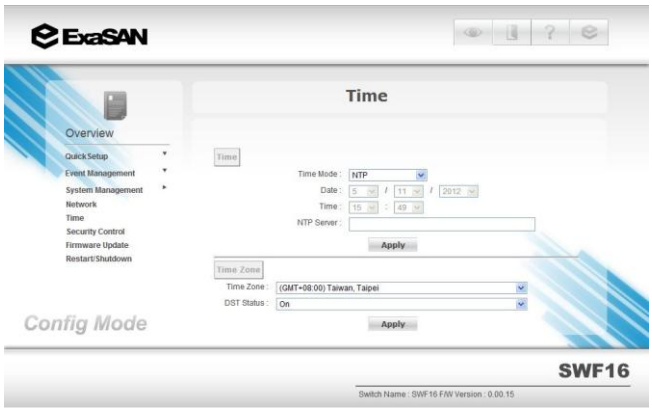
4.4.2.1 Static

Selecting the correct time and date. Then click “Apply”

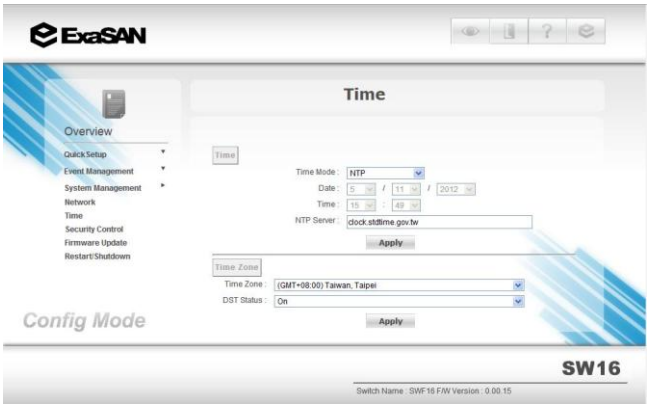


4.4.2.2 NTP

When you select NTP, you need to setup a NTP server for the function. If the NTP server that you type in doesn't exist or not been detected, SW16 would use static time setting.

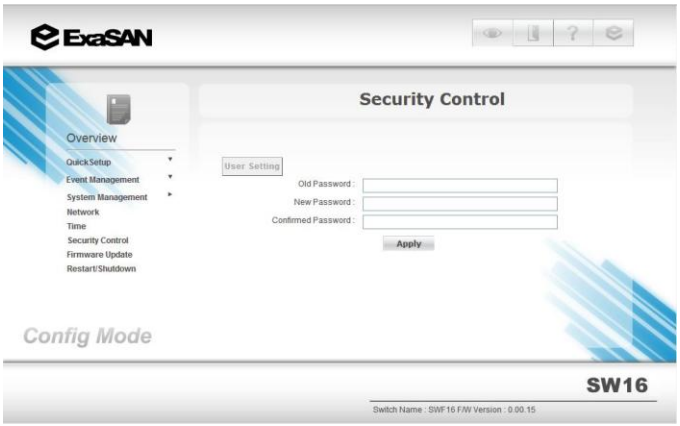


You can enter any intranet or internet NTP server. And then click "Apply" to process.
For example: NTP server – clock.stdtime.gov.tw



4.4.3 Change Password – "Security Control"

The only function in "Security Control" is to change login password for entering SW16 web GUI. When you click "Security Control", you'll find the following figure



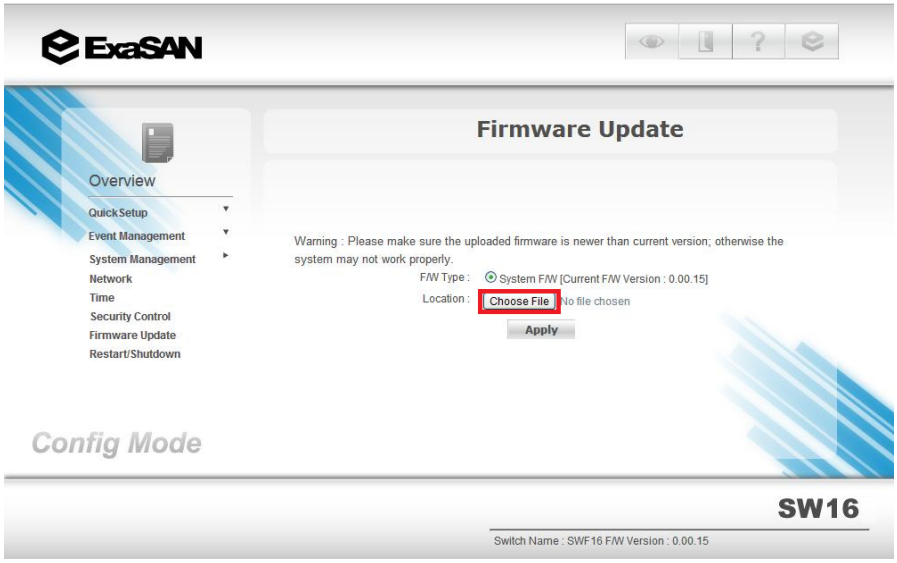
4.4.4 Firmware Update

For some reason, users might need to update the firmware of their SW16. “Firmware Update” is the function to reach the purpose.

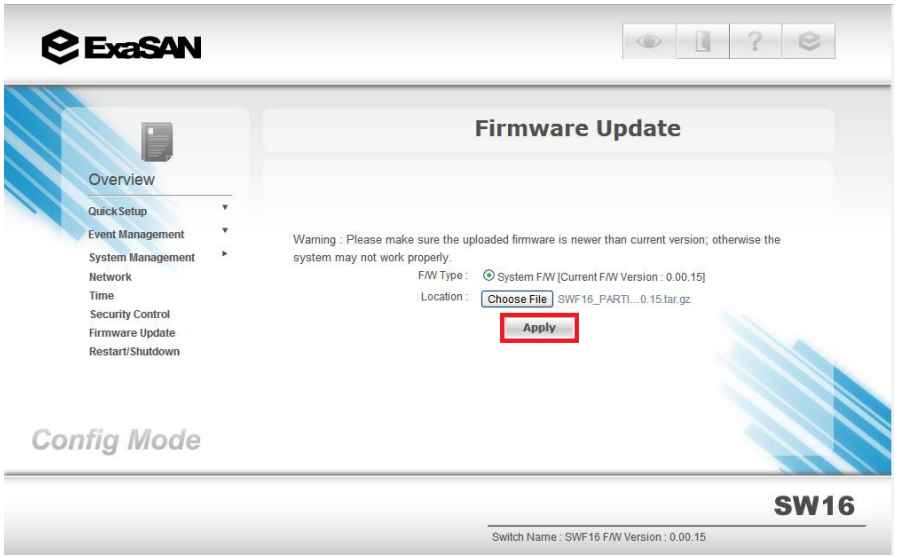
Note

- Before you start to update the firmware of SW16, please power off all of the clients or host that connected to the SW16.
- Download File from website http://www.accusys.com.tw/support/download.html, the directory is /ForSAN/{switch}/System Code/xxx.zip, unzip it.

1. To click “**Choose File**”

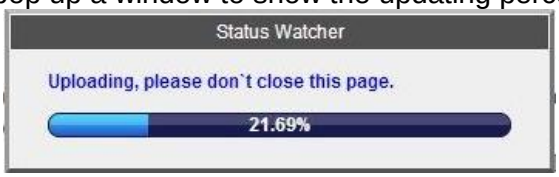


2. Selecting firmware file, click “Apply” to continue the processing



3. Then pop up a confirmation window. If you ensure to update the firmware of the switch, click “Confirm”

4. It would pop up a window to show the updating percentage.



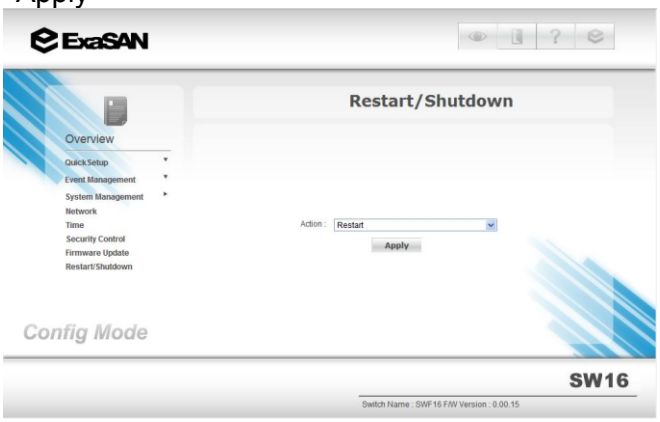
Note
It would take about 30 minutes for completely updating. Please check the processing bar to ensure it works fine in the period.

5. Update firmware successfully

4.4.5 Restart / Shutdown

Use this function to restart the SW16.

- Selecting “Restart” or “Shutdown”
- Clicking “Apply”



Note
Please ensure all clients are powered off before restart.

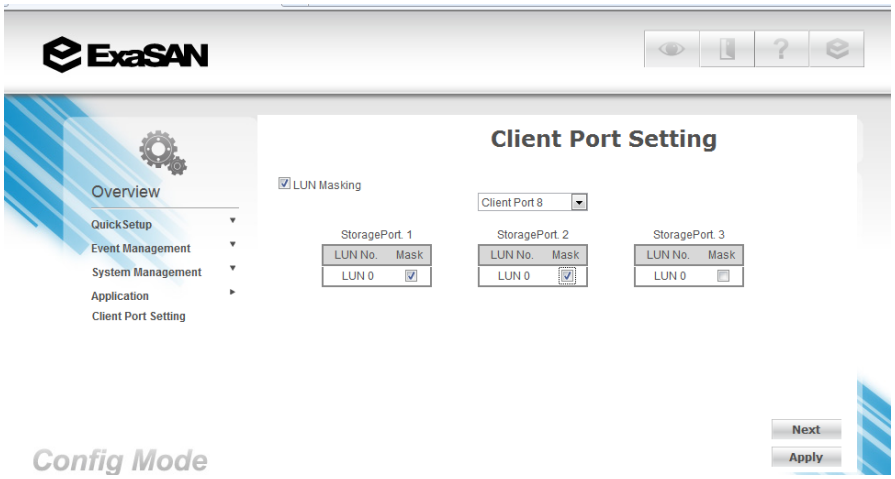
4.5 Application

For some special application, you may need to hide specific LUN for designated client port on switch level (same as Fibre zoning). You can easily configure **LUN masking** to define which client port mask specific LUN.

Following example is configuring to mask LUN0 of StoragePort 1(A) & StoragePort 2(B) for Client Port 8.

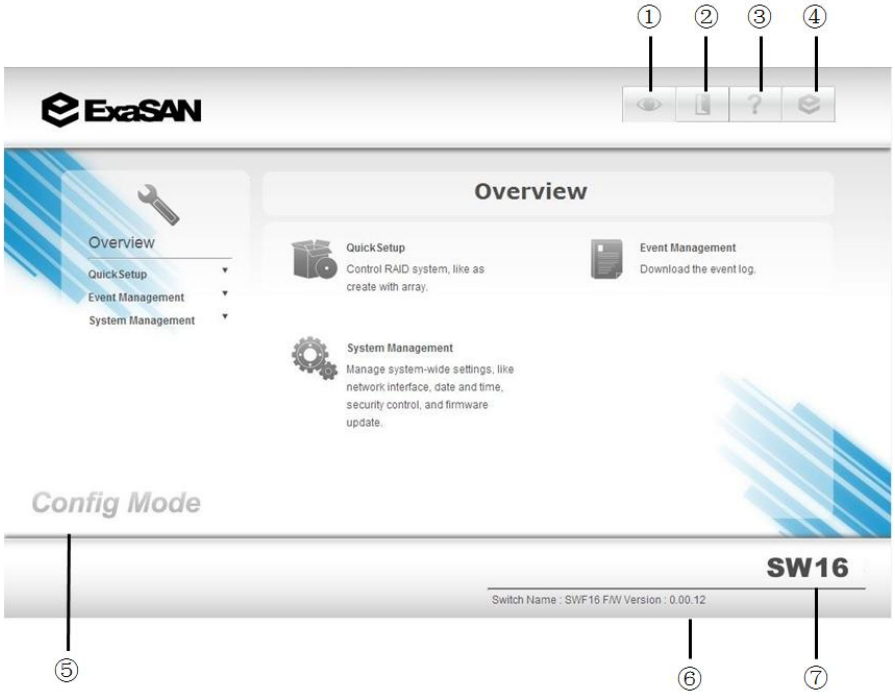
Step1. Select Client Port8
Step2. Check the LUN0 box under StoragePort1(A) & StoragePort2(B)
Step3. Click Apply to make it available.

Now, Client Port 8 cannot recognize the LUNs of StoragePort 1(A) and StoragePort 2(B).



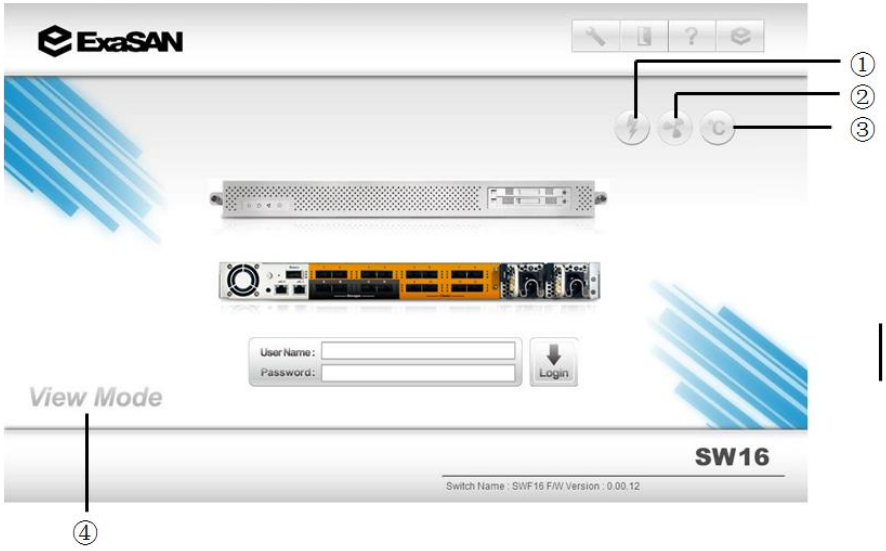
4.6 Environment status monitoring

After users finish the setting of the SW16, they can click "①" to go to "View Mode" to check more environment information of the SW16. The following figure is shown other helpful functions but not explained in chapter 4.1 to 4.4.



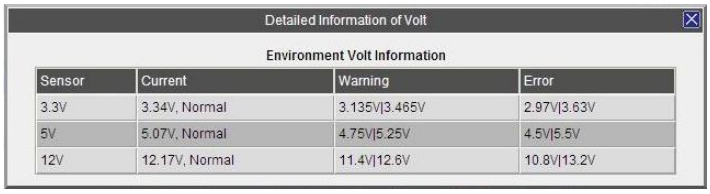
	Function	Description
1	Go to View Mode	go to "View Mode" to check more information
2	Logout Config Mode	Clicking the icon to logout "Config Mode"
3	Help	Users can find out some information
4	About the switch	About the switch version
5	Config Mode	The web GUI is in the configuration mode
6	FW version	Show the firmware version
7	SW16	The ExaSAN switch's model name

When users click "①" in previous figure to go to "View Mode", the web GUI is shown as following figure

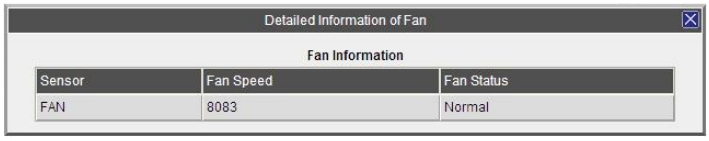


	Function	Description
1	Voltage	Check the voltage status
2	FAN	Check the FAN speed status
3	Temperature	Check the current temperature
4	View Mode	The web GUI is in “View Mode”

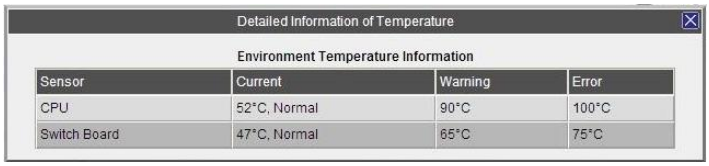
When users click “Voltage” icon, the web GUI would pop up a window as following


Detailed Information of Volt
Environment Volt Information
Sensor | Current | Warning | Error
3.3V | 3.34V, Normal | 3.135V|3.465V | 2.97V|3.63V
5V | 5.07V, Normal | 4.75V|5.25V | 4.5V|5.5V
12V | 12.17V, Normal | 11.4V|12.6V | 10.8V|13.2V

When users click “FAN” icon, the web GUI would pop up a window as following



When users click “Temperature” icon, the web GUI would pop up a window as following


Detailed Information of Temperature
Environment Temperature Information
Sensor | Current | Warning | Error
CPU | 52°C, Normal | 90°C | 100°C
Switch Board | 47°C, Normal | 65°C | 75°C

5. RAID Overview

5. RAID Overview

This chapter gives an overview of RAID storage system within the context of recommended setting of ExaSAN based SAN environment to provide fast, shared storage to client computers.

5.1 How RAID Works

RAID, or Redundant Array of Independent Disks, is a data-storage technology that spreads data across multiple drives. This technology provides several benefits over a single large hard disk, including:

- Data redundancy for protection and availability
- Higher performance as a result of reading or writing on several drives simultaneously
- Scalability for expansion of storage

The ExaSAN-family RAID systems use a hardware controller, which manages up to 48 HDDs. By segmenting and writing or reading data on multiple drives simultaneously, the RAID controller achieves fast and highly efficient storage and access.

The way the controller stores and retrieves data on the RAID system is determined by the RAID level and storage method you choose. For ExaSAN applications, the recommended setting is mainly RAID 1 and RAID 5, which will be discussed in details later in this chapter.

Once you have defined a group of drive modules as a RAID set, the controller groups those drives into “logical disks.” On the ExaSAN RAID system, each logical disk appears to the client system as one Logical Unit (LUN), regardless of the number of actual drives in that logical unit.

5.2 Data Storage Methods

The controller stores and retrieves data on a RAID system using techniques such as “data striping”, “data mirroring”, and “data parity”.

5.2.1 Data Striping

Multiple hard disk drives in a RAID group, referred to as a “set” or “array,” are divided (partitioned) into stripes. The controller spreads stripes across the disks in alternating sections on each drive.

In data-intensive environments such as digital video editing, performance is optimized by writing data across small stripes, so that each record spans all drives. This method ensures that access to large records is very fast because data is transferred in parallel across multiple drives.

5.2.2 Data Mirroring

To mirror data, the RAID controller duplicates all data on two different disks. One disk is the primary; the other is the mirrored disk. The primary and mirrored disks are synchronized; that is, anything written to one disk is also written to the other. Mirrored data is very secure because if one disk fails, the data is available from the other disk.

5.2.3 Data Parity

The controller can generate “parity” for the ability to protect and rebuild data. Parity protects stored information without requiring data mirroring. When data is protected by parity, it is still available if a drive fails. Parity-protected data is reconstructed using the parity formula. You can

remove and replace a failed disk (known as “hot swapping”), and the controller then rebuilds the data using the information on the remaining drives.

5.3 RAID Levels

The ExaSAN RAID system supports several RAID levels and configurations. Each level has a different architecture and provides varying degrees of performance and fault tolerance. Each level has characteristics to achieve maximum performance or redundancy depending on the data environment.

5.3.1 RAID 0: Striping

RAID level 0, striping only, is the fastest and most efficient array type, but offer no fault-tolerance. Any drive failure destroys the data in the array.

5.3.2 RAID 1: Mirroring

RAID level 1, mirroring, has been used for Metadata LUN because of its simplicity and high levels of reliability and availability. Mirroring uses two drives, each drive stores identical data. RAID 1 provides very high data reliability and improved performance for read-intensive applications, but this level has a high capacity cost because it retains a full copy of your data on each drive in mirror set.

In a RAID 1 configuration, the capacity of the smallest drive is the maximum storage area.

5.3.3 RAID 5: Independent data disks with distributed parity

By distributing the parity information across all drives in a set, RAID level 5 achieves high reliability and data availability. It also offers the highest read data transaction rate of all levels along with a medium write rate. The low ratio of ECC (Error Correction Code) parity disks to data disks offers hardware efficiency. Disk failure has a moderate impact on the total transfer rate.

5.3.4 RAID 6: Independent data disks with two Independent parity schemes

RAID level 6 extends RAID level 5 by adding an additional parity block; thus it uses block-level striping with two parity blocks distributed across all member disks. RAID 6 does not have a performance penalty for read operations, but it does have a performance penalty on write operations because of the overhead associated with parity calculations.

RAID 6 is no more space inefficient than RAID 5 with a hot spare drive when used with a small number of drives, but as arrays become bigger and have more drives the loss in storage capacity becomes less important and the probability of data loss is greater. RAID 6 provides protection against data loss during an array rebuild, when a second drive is lost, a bad block read is encountered, or when a human operator accidentally removes and replaces the wrong disk drive when attempting to replace a failed drive.

5.3.5 RAID 0+1: Striped set with Mirroring

RAID 0+1 combines the advantages of RAID 0 and RAID 1 with none of the disadvantages. RAID 0+1 creates a mirror of the primary striped set. RAID 0+1 provides optimal speed and reliability.

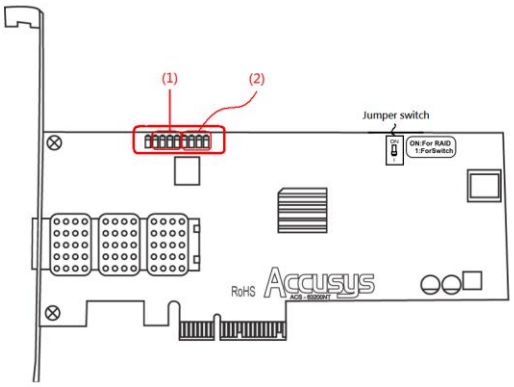
6. Appendices

Appendix A: FAQs

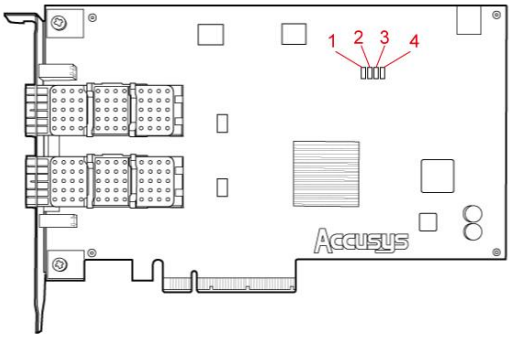
1. **Q: What is the different of SW16 and SWF16 V2?**
   A: SW16 is the pure PCIe 2.0 switch of ExaSAN switch series. SWF16 V2 is a three-in-one PCIe 2.0 switch, includes Metadata mirror drives, SANit V2 MDC (SAN management software) and PCIe 2.0 switch.

2. **Q: After an array has been created in RAIDGuard X, but the host does not find the array volume.**
   A: Please check the LUN Mapping to ensure the array volume has been corrected mapped to a LUN. If this is not the case, try restarting the system and it will be automatically recognized. Once LUN is assigned, you can perform formatting and mounting.

3. **Q: What does the LEDs on the Host Bus Adapter mean?**
   A:
   For Z1M-G2:
   - (1) LEDs: External PCIe connection status
   - (2) LEDs: Internal PCIe connection status
     flashing LEDs indicate a PCIe Gen1 connection, while solid LEDs indicate a PCIe Gen2 connection.



For Z2M-G3:
LED 1: HBA card properly connect to the PCIe slot on the motherboard
LED 2: The upper QSFP connector is active as SAN mode
LED 3: The lower QSFP connector is active as DAS mode
LED 4: The HBA card is failure, system disconnected



4. **Q: Why doesn't the performance reach the expected levels while testing the ExaSAN RAID system? Why isn't the performance steady enough?**
   A: If the performance is unsteady or not achieving the expected level, in many cases, the HDD is the cause. Since the ExaSAN RAID system is a highly efficient product, there is extreme demand placed on each HDD. As a result, it is strongly recommended to use the newest enterprise level HDD.

5. **Q: Why is the RAID system generating warning beeps?**
   A: Please check the LED indicators on the ExaSAN RAID system front panel against the appropriate user documentation for your particular storage system. Follow the instructions to launch RAIDGuard X to obtain Event Log information for further analysis.

6. **Q: On a MAC host, after entering the GUI and adding a controller, there is no device listed. How can this be resolved?**
   A: Please first confirm whether the hardware environment of the RAID system is functional. Also, ensure that the system drivers have been correctly installed. Next, go to "**Utilities > System Information> Software > Extensions"** and check whether Accusys6xxxx is listed. In order to confirm whether GUI Server Service is running on the system, Go to "Utilities > Activity Monitor" and check whether the program name **DTRGuiSrv01** is under the program column. If the situation persists, please verify again that the hardware environment is not the source of the problem and reinstall using the MAC installer.

7. **Q: When inserting the HDD into my RAID system, why does RAIDGuard X show the HDD mode as Lock?**
   A: The lock indicates that the HDD has been previous used in Accusys products and that it contains a portion of a RAID data. If the data can be deleted, you can unlock the HDD.

8. **Q: I have connected the cable to the Host server, but I can't see "new disk drive" on the host device management.**
   A: There are three possibilities:
   a. Please ensure the QSFP cable is connected securely. You should be able to hear a "click" sound when you connect the cable to the connector.
   b. Please check the jumper switch on the HBA(Z1M). When the switch is in the "On" position, the HBA card is enabled for storage mode for directly connect to RAID system. In the "1" position, the HBA is enabled for switch mode for the switch.
   c. Please check if the installer and the driver have been installed correctly. If the installation has completed and the error still persists, it may be a compatibility issue. Send an email to support@accusys.com.tw and briefly describe the problem. Be sure to include the driver error code, the motherboard (or host) model name and the OS. We will contact you to assist you in resolving the issue.

Appendix B: RAIDGuard X Introduction

RAIDGuard X Menu Bar

The menu bar across the top contains the following functions:

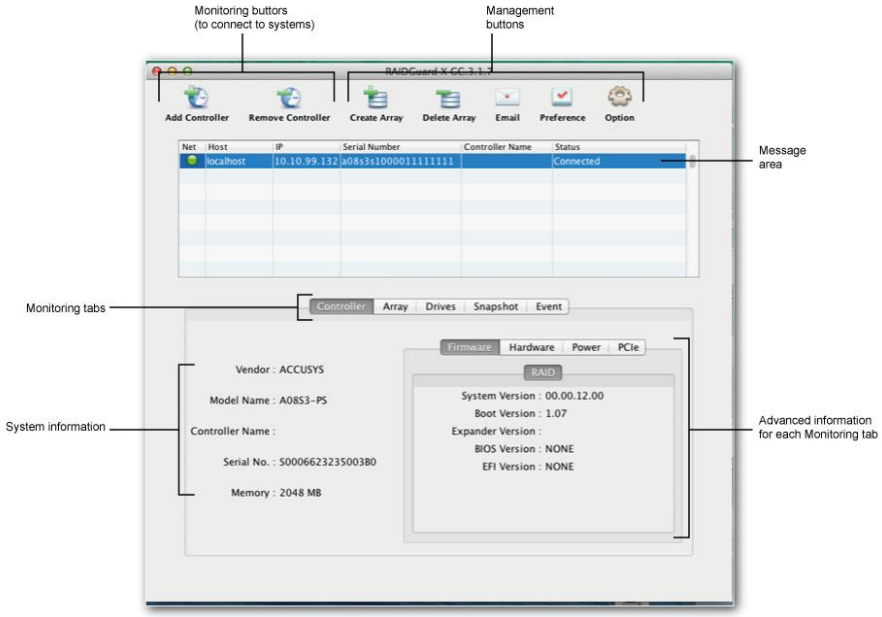
Function		Description
File	Exit	Close the program
	Load Controller List	Refresh the controller list
	Language	English and Japanese are supported
Controller	Manual Add Controller	Manually search and add the controller
	Update	Update RAID controller firmware (System Code, Boot Code, etc.)
	Dump controller log	Download the event log for troubleshooting
Help	Search	Search keyword in RAIDGuard X
	Help Center	Displays the help for RAIDGuard X

Note
Run **Dump controller log**, events are automatically generate a zip file and saved on directory as below;

- MacOS: save in /Applications/RAIDGuard X/Log
- Windows: save in /program file/accusys/exasan/log
- Linux: save in /{RAIDGuard X install folder}/log

Please send the log file to your vendor or Accusys tech support team to analyze. support@accusys.com.tw

RAIDGuard X main console

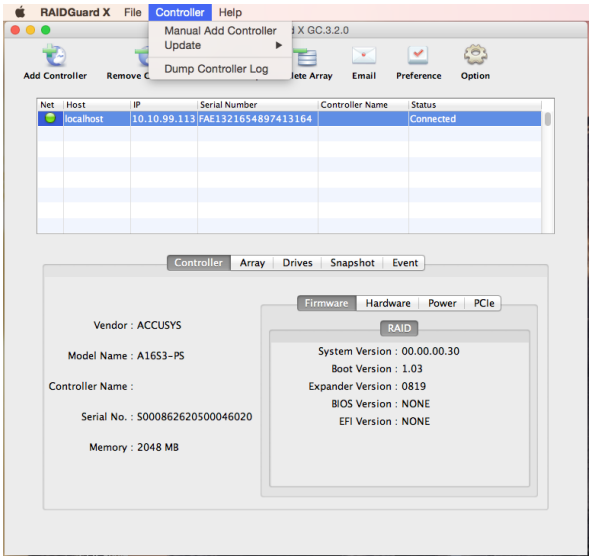


Function	Description	
Monitoring Buttons	**Add controller** into RAIDGuard X (for DAS only)	
	Remove controller from RAIDGuard X	
Management Buttons	**Create array** in the RAID system	
	Delete array in the RAID system	
	Email to set email notification	
	Preference	**Drive Lag Proof** Enable/ Disable
		NCQ mode Enable/ Disable
		SMART Mode Enable/ Disable
		Beeper Enable/ Disable
		Equalization Enable/ Disable
		Cache of controller and drives can be enable/disable
		MISC for controller Time setup
	Option	**Slicing** an existing array for multiple slices
		LUN Map setup for multiple slices
		Expansion with new drive into an array
		Migration between different RAID level
		Snapshot for backup data in a particular time
		Health Center for check array status
		Unlock Drives from locked mode

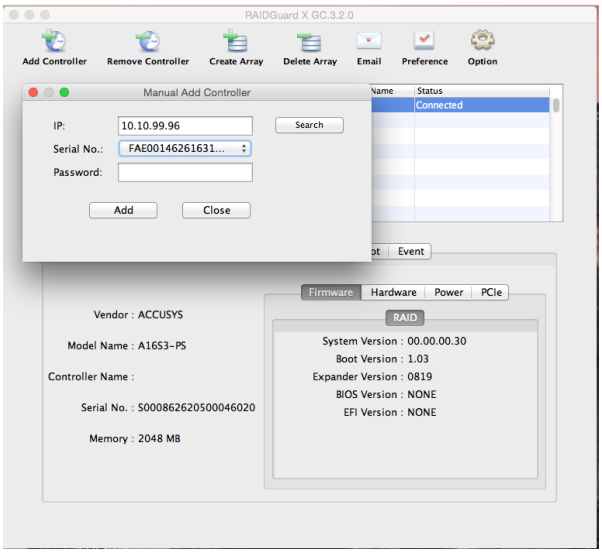
Manual Add Controller

In a SAN connection, firewall is used or special network settings are in place, RAIDGuard X client may not be able to detect the Server in the Main Menu. In this case, you can manually add another controller in the network.

1. Click on Controller on the menu bar and select **Manual Add controller**.



2. Enter the Server or Switch IP.



3. Click **Search** and wait for the Serial Number to populate.
4. Type the password (default is 00000000) for the controller.
5. Click **Add** to finish adding the controller.

Removing

To remove a controller, select a controller and then click the **Remove Controller** button to remove the controller from the table. When the popup window appears, select **Yes**.

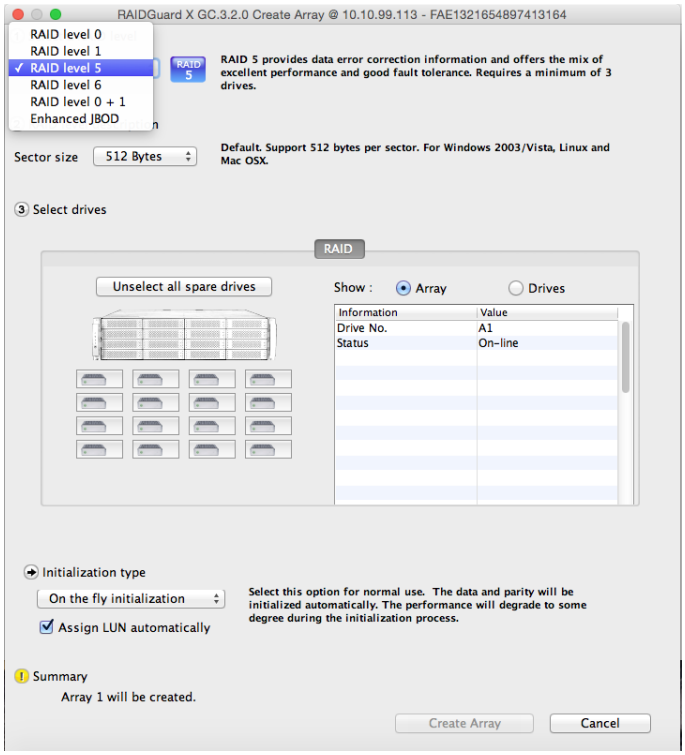
Creating an Array

When the RAID controller is first configured, an array needs to be set up. This array tells the controller how many disks to use and what their function should be.

Follow the steps below to create an array:

1. Select the RAID level from the drop down menu. Available levels are: 0, 1, 5, 6, 0+1 and JBOD.

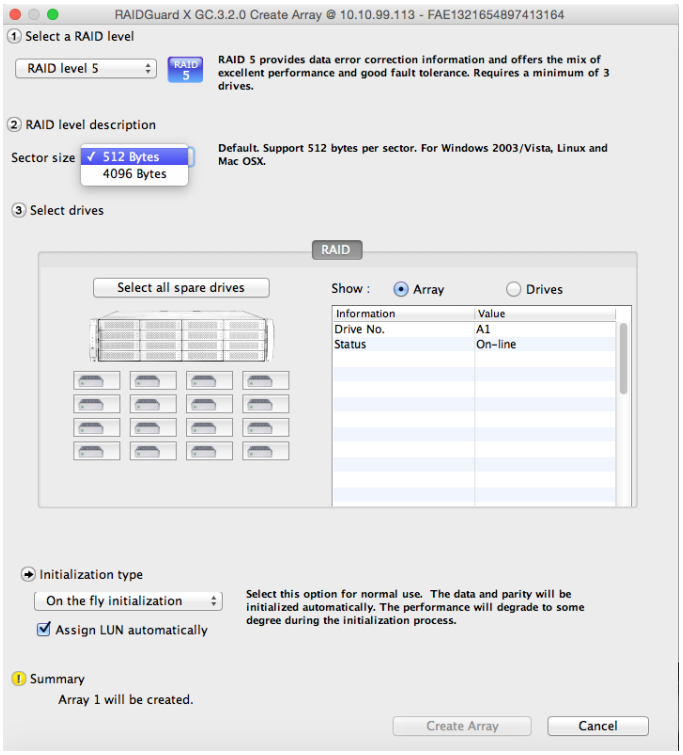
> **Note**
> Each RAID level has a minimum disk requirement. This is shown in the information to the right of the drop down list. For example, RAID 5 requires at least 3 drives.


RAIDGuard X GC.3.2.0 Create Array @ 10.10.99.113 - FAE1321654897413164
RAID level 0
RAID level 1
RAID level 5
RAID level 6
RAID level 0 + 1
Enhanced JBOD
RAID 5 provides data error correction information and offers the mix of excellent performance and good fault tolerance. Requires a minimum of 3 drives.
Sector size
512 Bytes
Default. Support 512 bytes per sector. For Windows 2003/Vista, Linux and Mac OSX.
3 Select drives
RAID
Unselect all spare drives
Show :
Array
Drives
Information
Value
Drive No.
A1
Status
On-line
Initialization type
On the fly initialization
Assign LUN automatically
Select this option for normal use. The data and parity will be initialized automatically. The performance will degrade to some degree during the initialization process.
Summary
Array 1 will be created.
Create Array
Cancel

> **Note**
> Details on the RAID levels are in **Chapter 5 RAID Overview**.

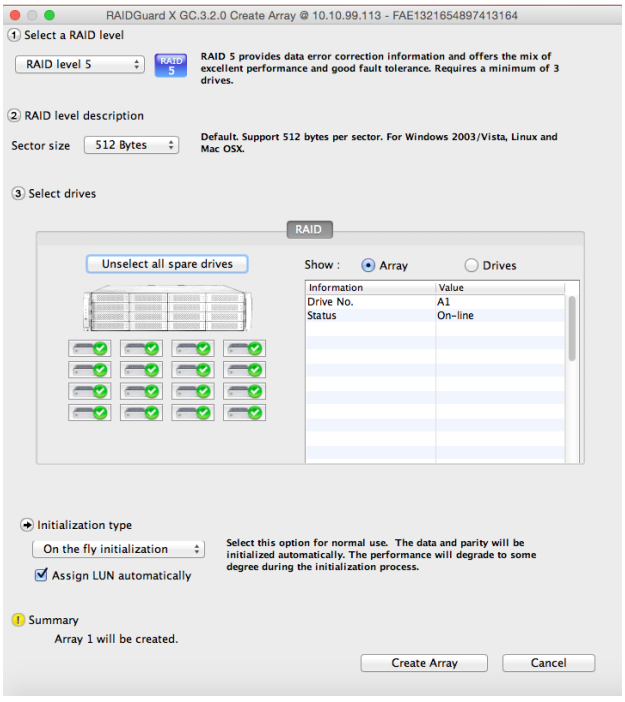
2. Select the stripe size from the drop down menu. Available stripe sizes are: 8-256KB. The greater the stripe size, the faster the I/O output for each drive. This speeds up disk access.

3. Select the sector size from the drop down menu. Available sector sizes are 512 bytes (default) and 4096 bytes. The sector size 4096 bytes is only supported by Windows XP, and over 2 Terabyte function is used. For other OSs, please select 512 bytes (default).


RAIDGuard X GC.3.2.0 Create Array @ 10.10.99.113 - FAE1321654897413164
1 Select a RAID level
RAID level 5
RAID 5 provides data error correction information and offers the mix of excellent performance and good fault tolerance. Requires a minimum of 3 drives.
2 RAID level description
Sector size
512 Bytes
4096 Bytes
Default. Support 512 bytes per sector. For Windows 2003/Vista, Linux and Mac OSX.
3 Select drives
RAID
Select all spare drives
Show : Array Drives
Information
Value
Drive No.
A1
Status
On-line
Initialization type
On the fly initialization
Assign LUN automatically
Select this option for normal use. The data and parity will be initialized automatically. The performance will degrade to some degree during the initialization process.
Summary
Array 1 will be created.
Create Array
Cancel

4. Click on the drives to be added to the array. You can also click on **Select all spare drivers**.

> **Note**
> Unselected drives will be set to Hot (Global) spare drive. If a drive failure, spare drive will start to rebuild automatically.

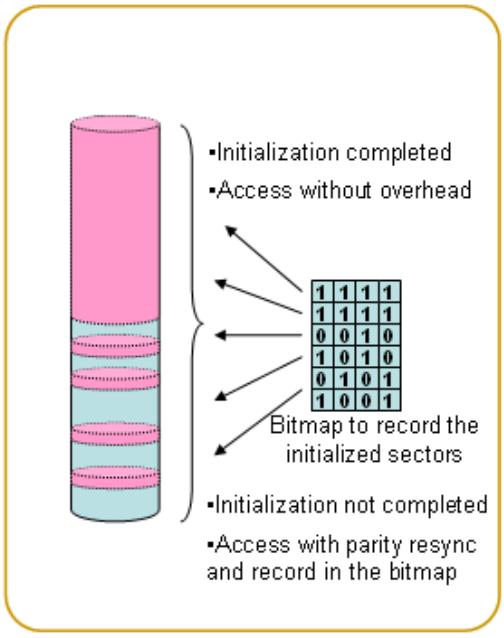

RAIDGuard X GC.3.2.0 Create Array @ 10.10.99.113 - FAE1321654897413164
1 Select a RAID level
RAID level 5
RAID 5 provides data error correction information and offers the mix of excellent performance and good fault tolerance. Requires a minimum of 3 drives.
2 RAID level description
Sector size
512 Bytes
Default. Support 512 bytes per sector. For Windows 2003/Vista, Linux and Mac OSX.
3 Select drives
RAID
Unselect all spare drives
Show : Array Drives
Information
Value
Drive No.
A1
Status
On-line
Initialization type
On the fly initialization
Assign LUN automatically
Select this option for normal use. The data and parity will be initialized automatically. The performance will degrade to some degree during the initialization process.
Summary
Array 1 will be created.
Create Array
Cancel

Optional: From the drop down menu, select either **On-the-fly initialization** or **Performance evaluation**.

On-the-fly initialization – ExaSAN RAID systems record the initialized sectors in the bitmap. All sectors are initialized only once. The entire initialization process will be completed faster and the performance will be better during the initialization.

During on-the-fly initialization, 65-75% of the full speed (of a created RAID) is still available. You can still use the RAID system during the RAID initialization.

Select this option (default) to ensure the completeness of the array. If this option is selected, it will recalculate the disk parity and data organization (how it is arranged). The amount of time required for the initialization process varies depending on the disk volume.


▪Initialization completed
▪Access without overhead
1 1 1 1
1 1 1 1
0 0 1 0
1 0 1 0
0 1 0 1
1 0 0 1
Bitmap to record the initialized sectors
▪Initialization not completed
▪Access with parity resync and record in the bitmap

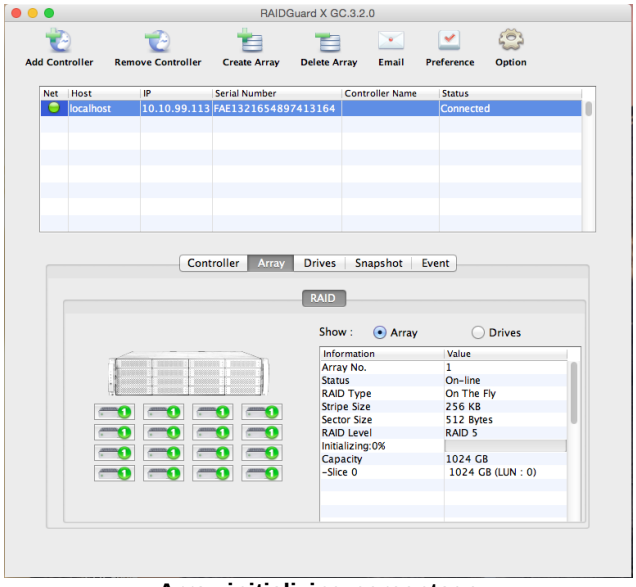
Performance evaluation – Select to evaluate the performance of the target array. Data and parity are not initialized. (No data protection when this mode is on).

> **Note**
> Once you click **Create Array** and you have selected On-the-fly initialization, you will see the initializing % on the Main screen.
>
> You will be able to use and configure the array immediately if it is created using On-the-fly initialization. However, the RAID performance of the array will be slightly lower than usual before the initialization is complete.

5. Assign LUN automatically

Check this box to automatically assign a LUN. You may choose to assign LUN manually under **Options**. However, you will not be able to use the RAID volume until it has been assigned a LUN.

6. Click **Create Array** to complete the process.



Array initializing percentage

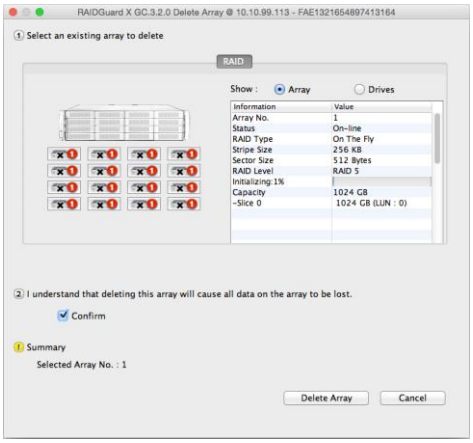
After the array has been created, the Main screen displays the newly created array with an array number. The array initialization progress is also displayed.

Arrays are assigned numbers in the order they are created. For example, the first array created is labeled with the “1” icon; the second array created is labeled with the “2” icon, and so forth.

> **Note**
> The ExaSAN RAID controller can support up to maximum of 4 arrays per RAID controller

Delete an Array

1. Click on the drives containing the array to be deleted.
2. Check the **Confirm** box. Click **Delete Array** to complete the process.



> **Caution**
> When you delete an array, all data on the hard disk drives will be lost.

Email Notification

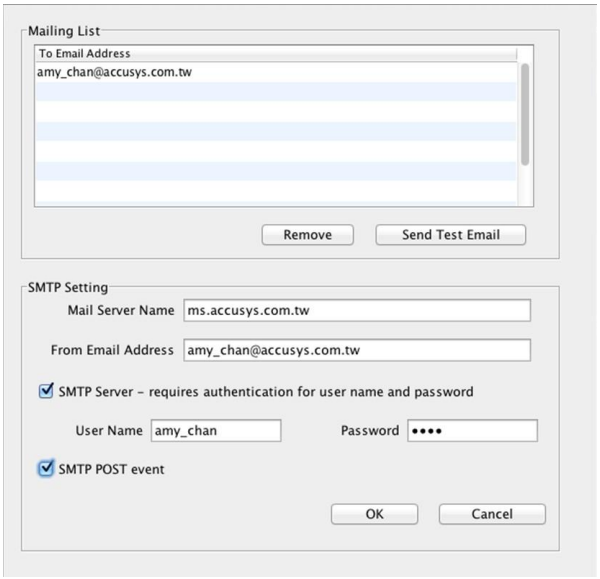
It may be necessary for network administrators to receive e-mails in the event of errors, alerts, and changes to the RAID array. These alerts can be e-mailed to a maximum of 20 e-mail addresses.

Mailing List
Enter the e-mail address(es) of people to receive controller error reports.
Click **Remove** to delete e-mail addresses from the list.
Click **Send Test Email** to check that the e-mail is working.

SMTP Setting
Mail Server Name – Enter the address of the mail server.
From Email Address – Enter the e-mail address of the mail server.
SMTP Server – requires authentication for user name and password
Check this box if your mail server requires a user name and password.

SMTP POST event
Check this box if wish to create a log for error events.

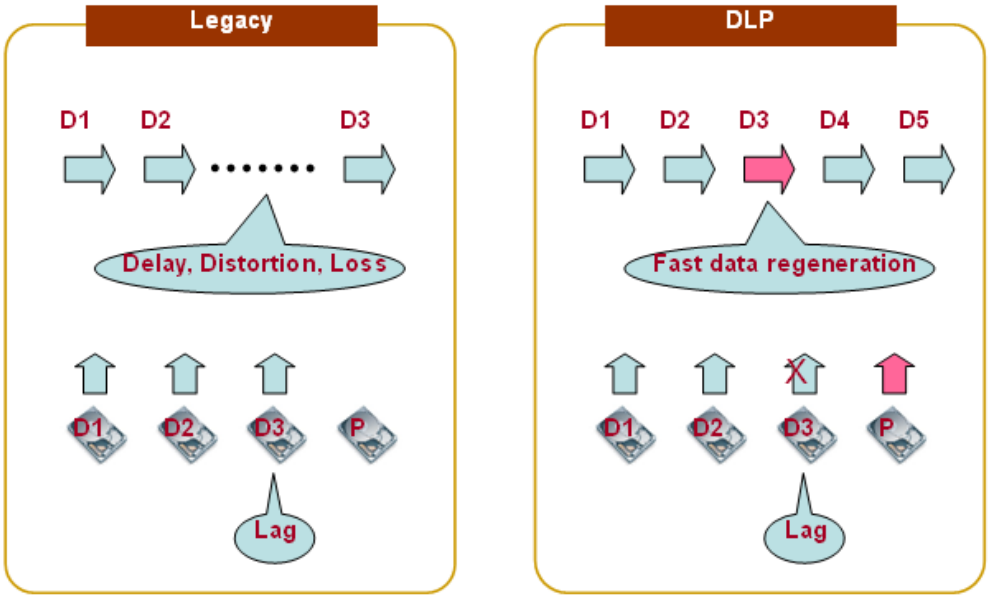
> **Note**
> 1. Ask your systems administrator for SMTP Server details.
> 2. Not support outbound SMTP mail service, e.g. Gmail, Hotmail, Yahoo.
> 3. Contact to tech support for more detail.



Preference

Disk Lag Proof Mode

This feature ensures the stability and continuity of the RAID performance. In RAID 5 and RAID 6, DLP prevents the aging or slow responds of a single hard disk from influencing the overall performance. The advantage of this feature will not be felt until some hard disks fail to perform well.



DLP concept

In the event of performance degradation or delay of a single drive due to aging, the ExaSAN RAID system reads both data and parity stripes concurrently. It bypasses the slow reads and returns data to the host with the regenerated data and to provide stabled performance based on the RAID parity.

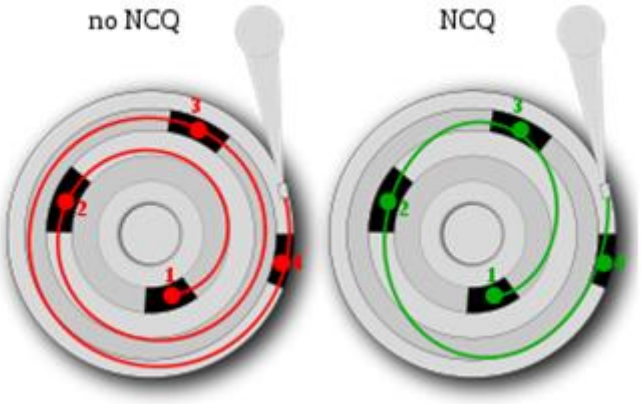
Note
Although slow responds of some hard disks can be tolerated in DLP mode, you may use S.M.A.R.T. function to check the conditions of hard disks in an array and replace the faulty ones.

Note
This function does not support JBOD and NRAID.

NCQ

NCQ (Native Command Queuing) – This mode is designed for increasing disk drive access on SCSI and SATA disk drives. It can do this under certain situations by allowing the individual hard disk to internally optimize the order in which it executes the read and write requests it receives. This can reduce the amount of unnecessary drive head movement and resulting in better performance for work loads where multiple read/write requests and outstanding at the same time.

This situation most often occurs in server-type applications. However, the current technology actually slows down disk drive access in certain applications, such as video editing and sequential reads and writes, because of the added latency induced by NCQ.



NCQ concept

The figure above illustrates the access sequence in NCQ and non-NCQ mode. The content sequences of the two hard disks are the same: 1, 2, 3, 4. However, the access sequence in NCQ mode may vary to improve the performance.

> **Note**
> If Equalization mode is enabled, NCQ is automatically turned off.

SMART Mode

S.M.A.R.T. is a monitoring system of disk drives to detect and report on various indicators of reliability, in the hope of anticipating failure. ExaSAN RAID system supports S.M.A.R.T. Once this function is selected, you can select the check interval from the drop-down list. Choose from 1 minute to 8 hours for SMART Mode to be active. The RAID controller will command each hard disk to perform S.M.A.R.T. according to the check interval selected. The check results will be shown as an Event message in the main menu.

When running S.M.A.R.T., the performance of the system will be slightly affected. The higher the check frequency, the more the sequential access is influenced. It is recommended to turn off S.M.A.R.T. if high frequency is needed. On the other hand, running S.M.A.R.T. constantly allows you to monitor the conditions of hard disks at any time.

Different hard disk models and brands will have different attributes in the reporting of S.M.A.R.T. Event message will show all messages generated by the hard disk.

The option of time to check disk's S.M.A.R.T are 1,15,30,60 minutes and 2,4,8 hours. We strongly suggest set to 8 hours. Frequently check time will reduce the life time of hard drives

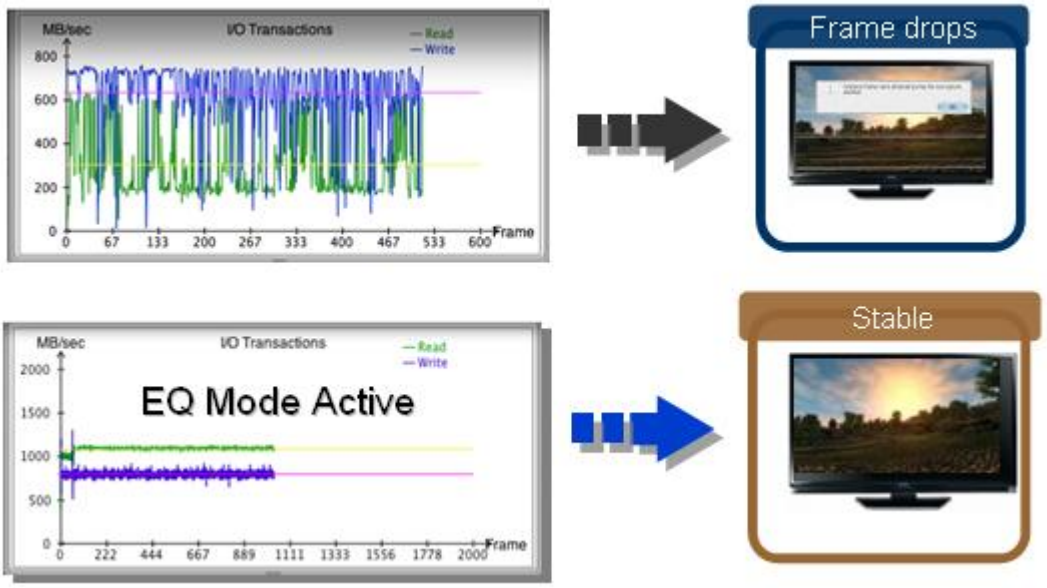
Beeper

Default Beeper option is enabled, the system will sound an audible alarm in the event of an error. Users can respond to the error promptly and carry out troubleshooting.

If the error indicated by the Beeper alarm has been resolved, you may uncheck the **Beeper** option.

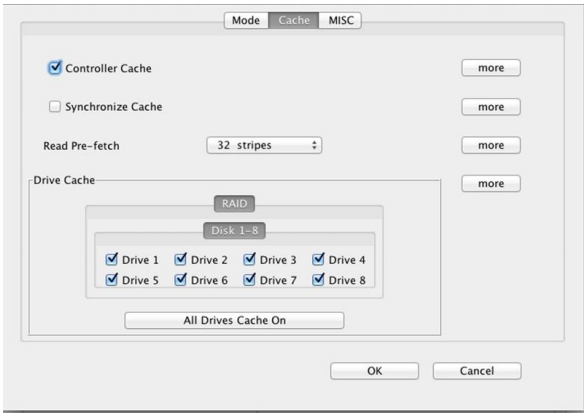
Equalization Mode

Regardless the transmission method, the data transmission speed cannot be guaranteed at all times. This feature allows the continuous I/Os to operate more smoothly and substantially reduce large fluctuations in efficiency during data transfer. For video editing, enable equalization to prevent video frame drops.



EQ mode concept

Cache



Controller Cache – Check this box to enable the controller cache. This speeds up the data transfer to and from the disks.

> **Caution**
> Data in cache may be erased if power down unexpected. Suggest using a UPS (uninterruptible power supply) to prevent this scenario.

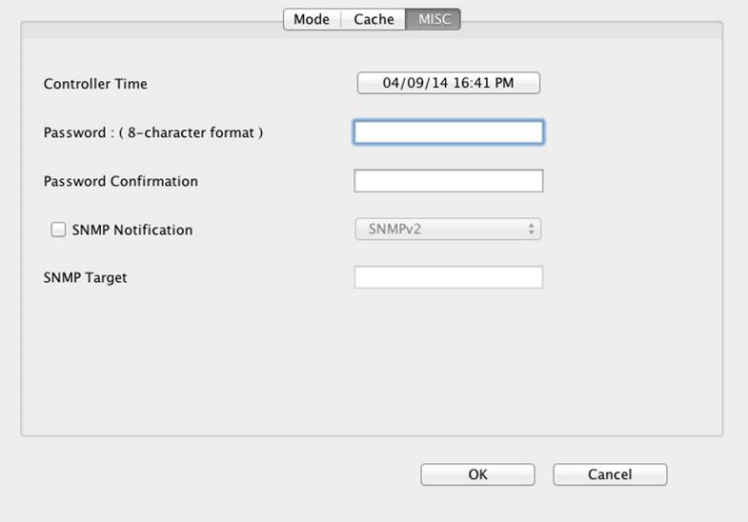
Synchronize Cache – Check this box to enable cache synchronization with drives, to ensure all write data is correct, there is a frequently latency time within. For video capture, disable synchronization, because the video capture needs to be able to constantly write data to the RAID storage without long latency.

Read Pre-fetch – Identifies sequential access patterns and aggressively pre-fetches patters into cache. From the drop down list, choose the number of stripes to pre-fetch. The default is 32; this is the recommended number.

Drive Cache – Choose which drives to cache. When more than one application accesses the database, the first applications cache needs to synchronize with the second. Each drive contains a built in write cache; checking these boxes chooses which drives to enable the caching on. Caching improves the efficiency and speed of data transfer.

All Drives Cache On/All Drives Cache Off – Click this button to enable/disable the caching on for all available drives.

MISC



MSIC (Minimal Instruction Set Computer) has standard RAID controller CPU time settings. The time of each event is displayed in the event logs in Event message.

Controller Time – Click this button to see a calendar and to change the time and date of the controller.

Password – Enter the new controller password. The default password is 00000000 (8 zeros). Type another 8 characters.

Password Confirmation – Confirm the new controller password.

> **Note:**
> Do not lose your password. If it is lost, you will have to contact your agent or the Accusys Support Team.

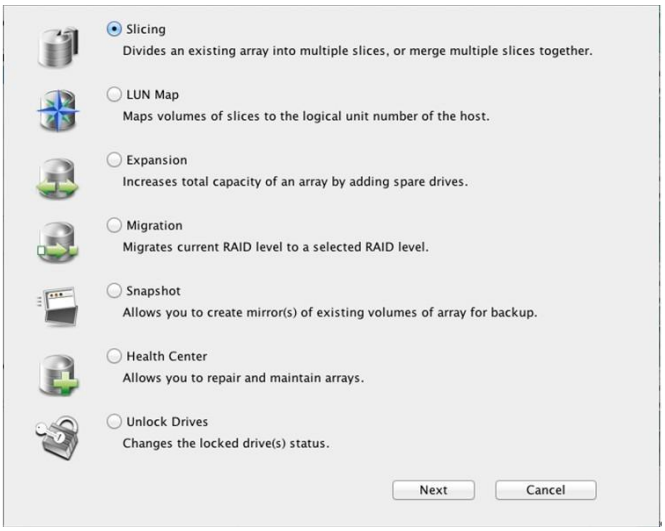
SNMP Notification – Select **SNMPv1** or **SNMPv2** to send notifications for error conditions and possible problems to the SNMP servers. SNMP stands for Simple Network Management Protocol.

SNMP Target – Enter the IP address for sending the SNMP notifications.

> **Note:**
> The ExaSAN RAID system supports SNMP. It can set "System on IP networks" and allows servers to manage the system remotely.

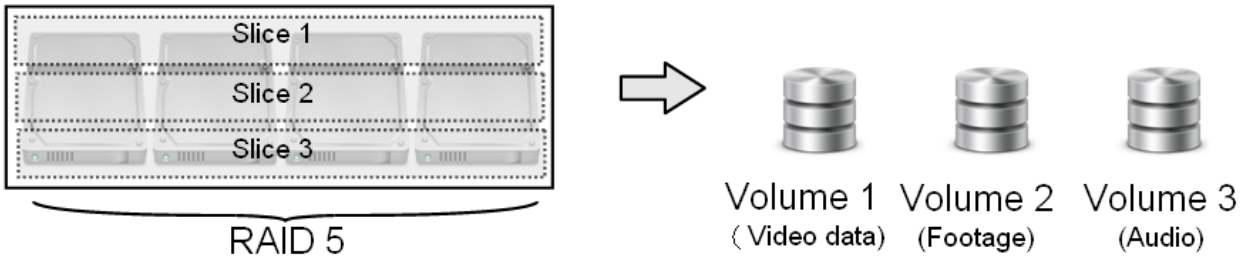
Option

The Options menu provides the methods for managing array. Click on the radio button for the required option, and then click **Next** to proceed.


Slicing
Divides an existing array into multiple slices, or merge multiple slices together.
LUN Map
Maps volumes of slices to the logical unit number of the host.
Expansion
Increases total capacity of an array by adding spare drives.
Migration
Migrates current RAID level to a selected RAID level.
Snapshot
Allows you to create mirror(s) of existing volumes of array for backup.
Health Center
Allows you to repair and maintain arrays.
Unlock Drives
Changes the locked drive(s) status.
Next
Cancel

Slicing

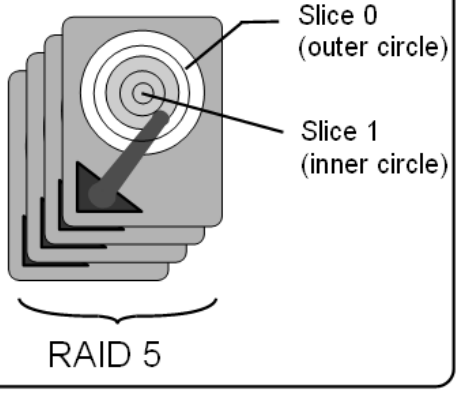
ExaSAN RAID slicing overcomes the inherent design of how data is stored on an HDD or RAID system by subdividing a RAID array into segments, or slices. These slices are effective hardware partitions of all drives in the array. Each slice is a separate LUN and appears as a separate volume on the host computer. After slicing, the LUN map must be set for each slice.



Slicing concept

Usage Scenario:

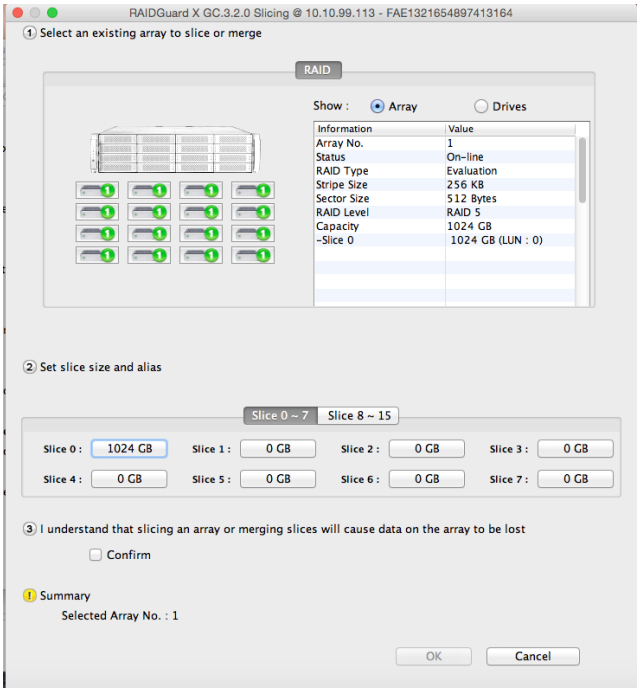
The access speed of the data stored in the outer circle is faster than that of the inner circle. Suppose that there are two slices in a hard drive. Slice 0 locates in the outer circles while Slice 1 the inner circle. In A/V making, you may store video data in Slice 0 and Audio data in random access in Slice 1.



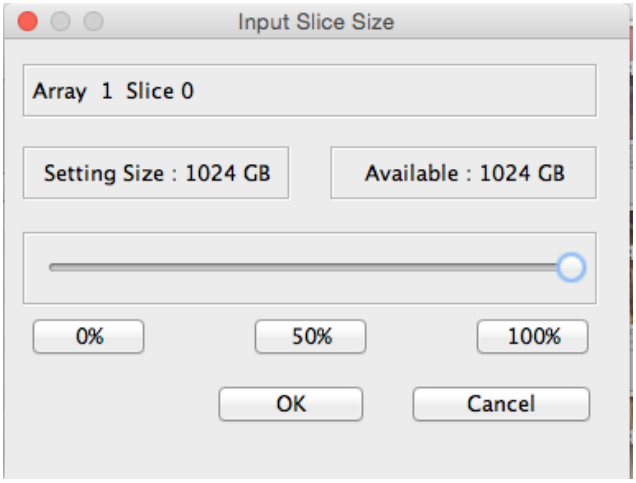
> **Note**
> You can create up to 16 slices per array and 64 LUNs on the controller. The total number of unique arrays' slices cannot exceed 16.

Follow the steps below to select an array to slice or merge.

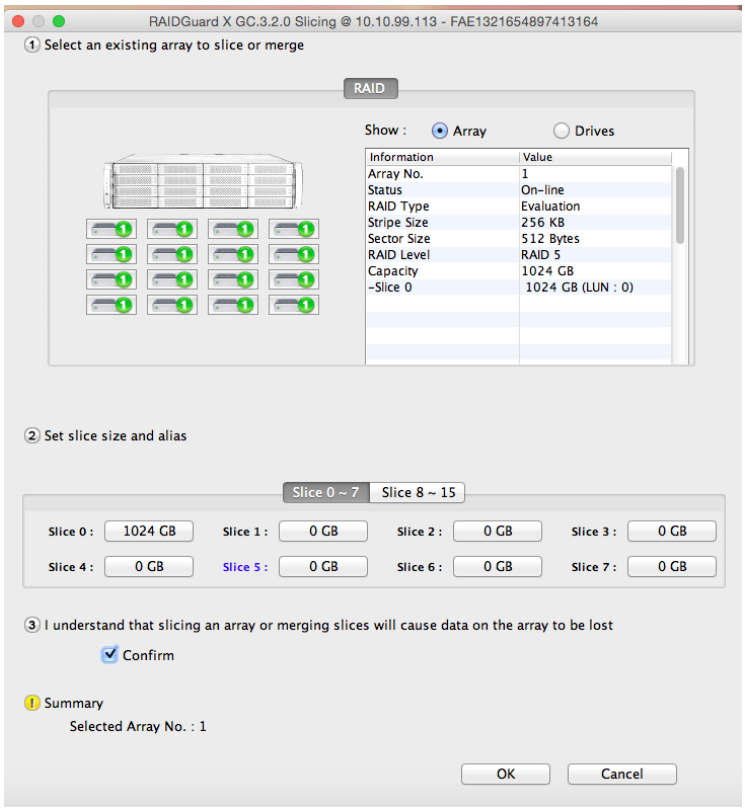
1. Select the array to slice or merge by clicking on a drive with an array number. The capacity is displayed. By default, Slice 0 contains the entire capacity of the disk array.
2. Click on Slice 0, and use the slide bar or buttons to free space for creating other slices. Click OK to confirm.


RAIDGuard X GC.3.2.0 Slicing @ 10.10.99.113 - FAE1321654897413164
1 Select an existing array to slice or merge
RAID
Show : Array Drives
Information Value
Array No. 1
Status On-line
RAID Type Evaluation
Stripe Size 256 KB
Sector Size 512 Bytes
RAID Level RAID 5
Capacity 1024 GB
-Slice 0 1024 GB (LUN : 0)
2 Set slice size and alias
Slice 0 ~ 7
Slice 8 ~ 15
Slice 0 : 1024 GB
Slice 1 : 0 GB
Slice 2 : 0 GB
Slice 3 : 0 GB
Slice 4 : 0 GB
Slice 5 : 0 GB
Slice 6 : 0 GB
Slice 7 : 0 GB
3 I understand that slicing an array or merging slices will cause data on the array to be lost
Confirm
Summary
Selected Array No. : 1
OK
Cancel

3. Click on the slice to create, and use the slider bar or buttons to adjust the size. Click **OK** to confirm.



4. Check the **Confirm** box and click **OK**.


RAIDGuard X GC.3.2.0 Slicing @ 10.10.99.113 - FAE1321654897413164
1 Select an existing array to slice or merge
RAID
Show : Array Drives
Information Value
Array No. 1
Status On-line
RAID Type Evaluation
Stripe Size 256 KB
Sector Size 512 Bytes
RAID Level RAID 5
Capacity 1024 GB
-Slice 0 1024 GB (LUN : 0)
2 Set slice size and alias
Slice 0 ~ 7
Slice 8 ~ 15
Slice 0 : 1024 GB
Slice 1 : 0 GB
Slice 2 : 0 GB
Slice 3 : 0 GB
Slice 4 : 0 GB
Slice 5 : 0 GB
Slice 6 : 0 GB
Slice 7 : 0 GB
3 I understand that slicing an array or merging slices will cause data on the array to be lost
Confirm
Summary
Selected Array No. : 1
OK
Cancel

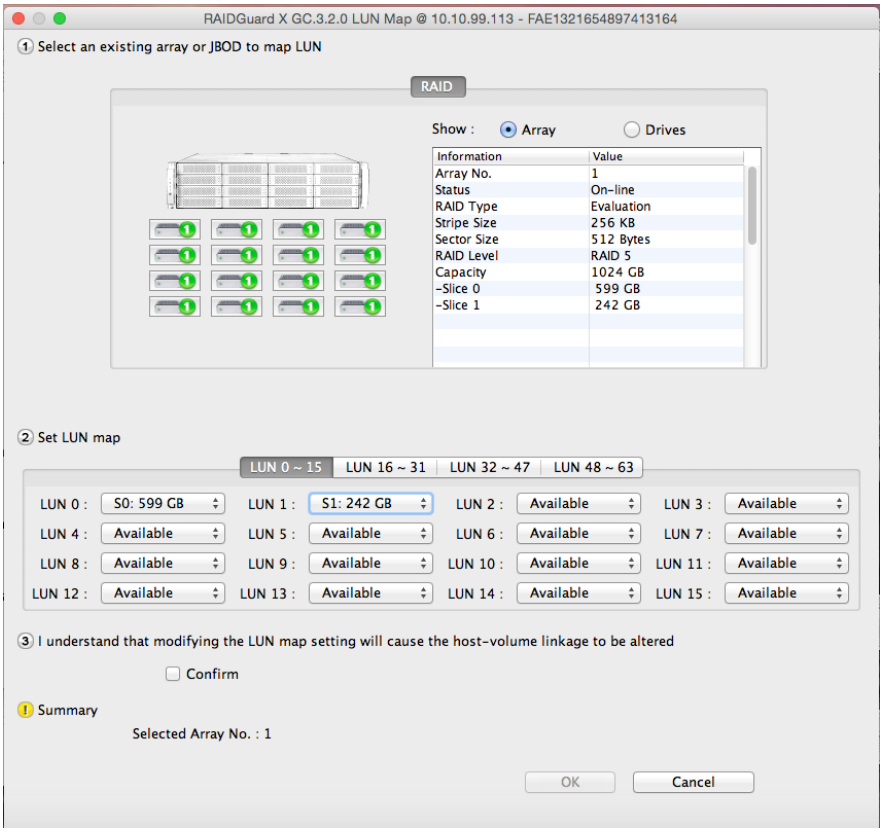
> **Note**
> Slices must be adjusted in order; for example - Slice 0, 1, 2, etc.

LUN Map

LUN, which stands for **L**ogical **U**nit **N**umber, is used to identify a logical unit in computer storage. When creating an array, you may select **Assign LUN automatically** to automatically assign a LUN to the new array. If **Assign LUN automatically** is not selected, you need to assign the LUN manually using LUN map. If the slice has been partitioned, you need to set its LUN Map.

> **Note**
> - One slice can only be assigned one LUN.
> - The ExaSAN RAID controller supports up to 64 LUNs

1. Select the array to map by clicking on a drive with an array number.
2. Choose a LUN and from the drop down list select a slice to map to. Repeat for multiple LUNs.
3. Check the **Confirm** box and click **OK**.


RAIDGuard X GC.3.2.0 LUN Map @ 10.10.99.113 - FAE1321654897413164
1 Select an existing array or JBOD to map LUN
RAID
Show : Array Drives
Information Value
Array No. 1
Status On-line
RAID Type Evaluation
Stripe Size 256 KB
Sector Size 512 Bytes
RAID Level RAID 5
Capacity 1024 GB
-Slice 0 599 GB
-Slice 1 242 GB
2 Set LUN map
LUN 0 ~ 15 LUN 16 ~ 31 LUN 32 ~ 47 LUN 48 ~ 63
LUN 0 : S0: 599 GB
LUN 1 : S1: 242 GB
LUN 2 : Available
LUN 3 : Available
LUN 4 : Available
LUN 5 : Available
LUN 6 : Available
LUN 7 : Available
LUN 8 : Available
LUN 9 : Available
LUN 10 : Available
LUN 11 : Available
LUN 12 : Available
LUN 13 : Available
LUN 14 : Available
LUN 15 : Available
3 I understand that modifying the LUN map setting will cause the host-volume linkage to be altered
Confirm
Summary
Selected Array No. : 1
OK
Cancel

Expansion

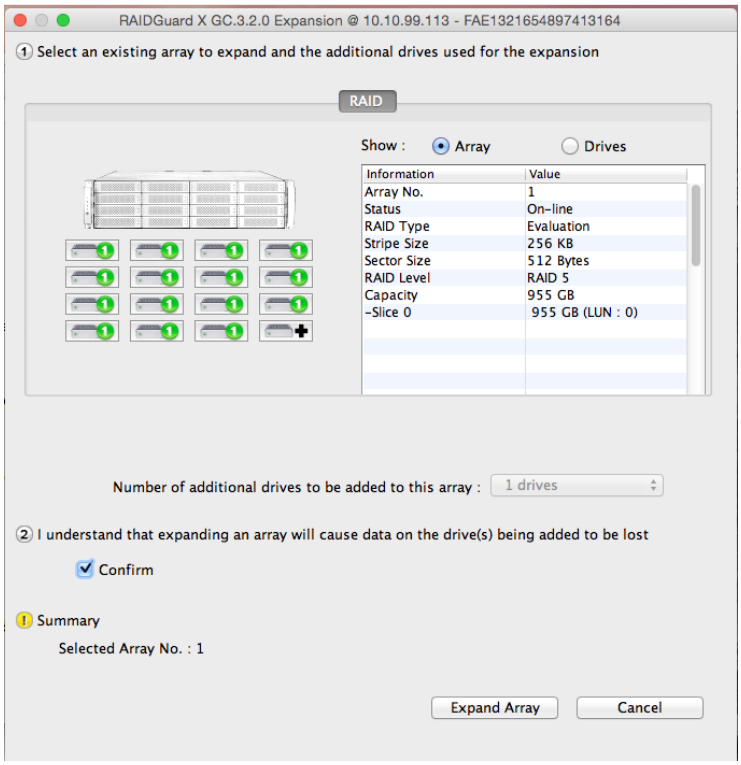
Expansion adds spare disks or new hard drives to an existing array. This is no need to create a new array or stop an array; you may add new disks online while the array is in use. Expansion can enlarge the capacity and frequency of an array. Although you may still access the array while doing Expansion, its performance is affected considerably. You may check the progress of Expansion in the main view.

Example:

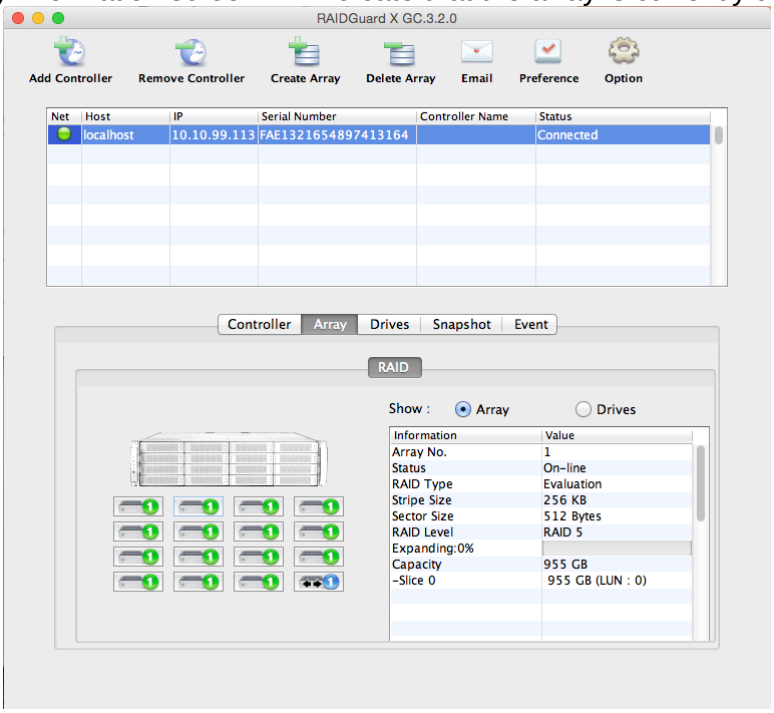
Note
The new hard drive must larger than existing drives of array.

Follow the steps below to select an array to expand.

1. Select the array to add additional drives to, and select the number of drives to be added. A "+" sign appears above the drives to be added.
2. Check the **Confirm** box and click **Expand Array**.


RAIDGuard X GC.3.2.0 Expansion @ 10.10.99.113 - FAE1321654897413164
1 Select an existing array to expand and the additional drives used for the expansion
RAID
Show : Array Drives
Information Value
Array No. 1
Status On-line
RAID Type Evaluation
Stripe Size 256 KB
Sector Size 512 Bytes
RAID Level RAID 5
Capacity 955 GB
-Slice 0 955 GB (LUN : 0)
Number of additional drives to be added to this array : 1 drives
2 I understand that expanding an array will cause data on the drive(s) being added to be lost
Confirm
Summary
Selected Array No. : 1
Expand Array
Cancel

3. The Main array information screen will indicate that the array is currently under expansion.

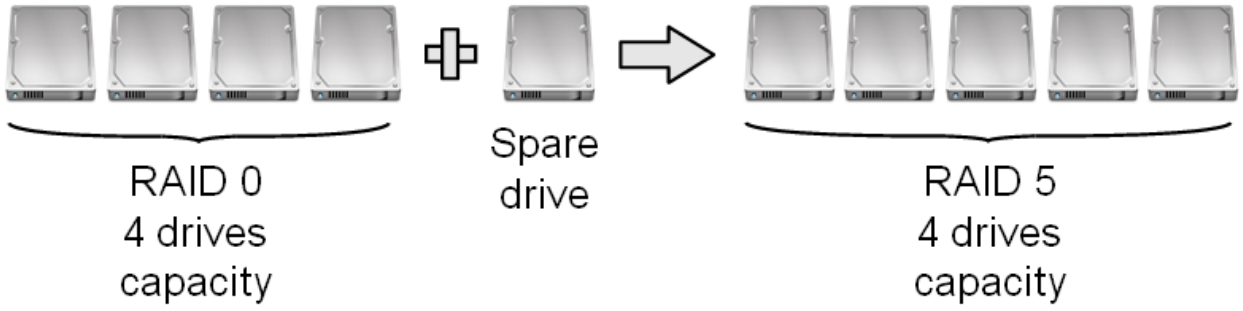


Migrations

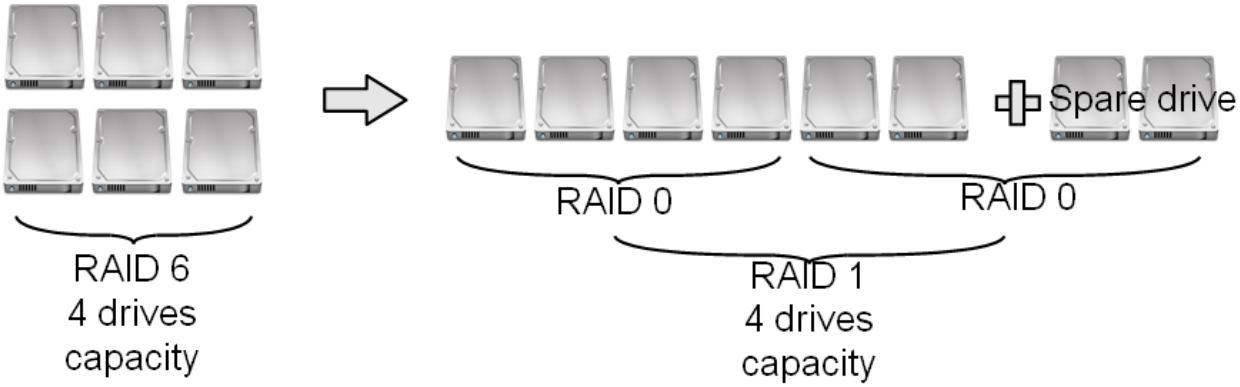
Different from Expansion, which enlarges an array by adding hard drives to a fixed RAID level, Migration changes the RAID level of an array. It allows live changes to the RAID without the need to delete the array and rebuild. This can be useful when new drives have been added, and a new array type needs to be created.

Example 1:
RAID 5 (12 drives) –Migrating→ RAID 0 (>11 drives)
RAID 5 (12 drives) –Migrating→ RAID 6 (>13 drives)
RAID 5 (12 drives) –Migrating→ RAID 0+1 (>22 drives)

Example 2:



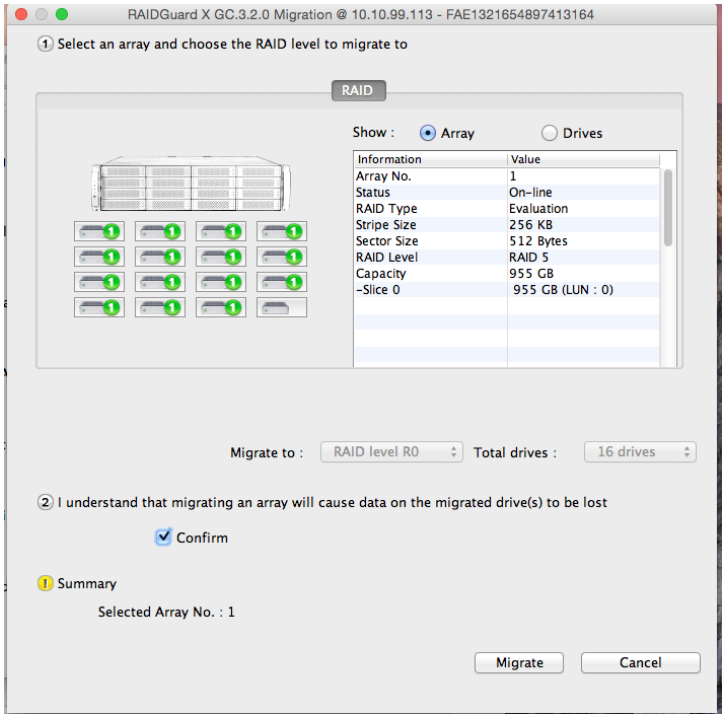
Example 3:



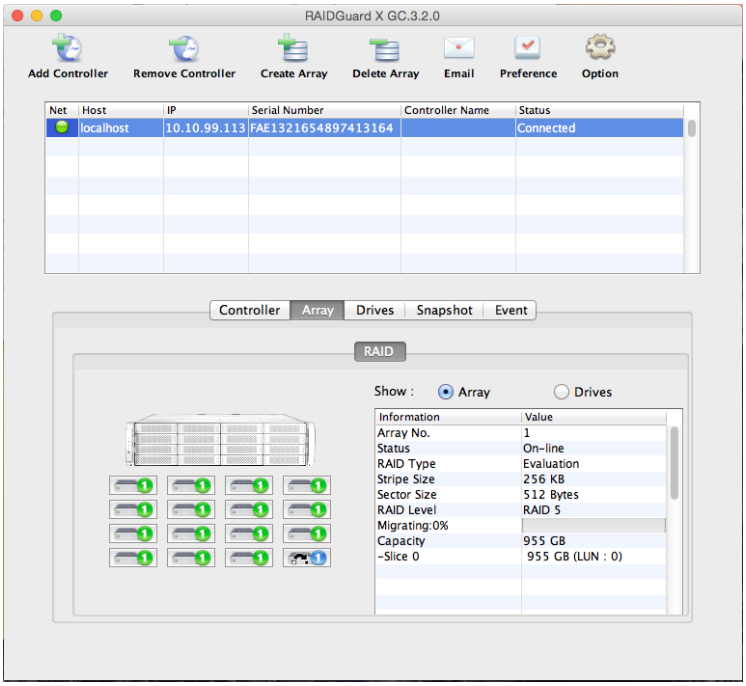
Note
The new hard drive must larger than existing drives of array.

Follow the steps below to select an array to migrate. This changes the RAID level, such as from RAID 1 to RAID 5.

1. Select the array to migrate. From the drop down menu, select the RAID level to migrate to, and then select the total number of drives to include in the array. A "+" appears above the drive(s) to be added, and a "-" sign above the drive(s) to be removed.
2. Check the **Confirm** box and click **Migrate**.


RAIDGuard X GC.3.2.0 Migration @ 10.10.99.113 - FAE1321654897413164
1 Select an array and choose the RAID level to migrate to
RAID
Show : Array Drives
Information Value
Array No. 1
Status On-line
RAID Type Evaluation
Stripe Size 256 KB
Sector Size 512 Bytes
RAID Level RAID 5
Capacity 955 GB
-Slice 0 955 GB (LUN : 0)
Migrate to : RAID level R0
Total drives : 16 drives
2 I understand that migrating an array will cause data on the migrated drive(s) to be lost
Confirm
Summary
Selected Array No. : 1
Migrate
Cancel

3. The main array information screen will indicate that the array is currently migrating.



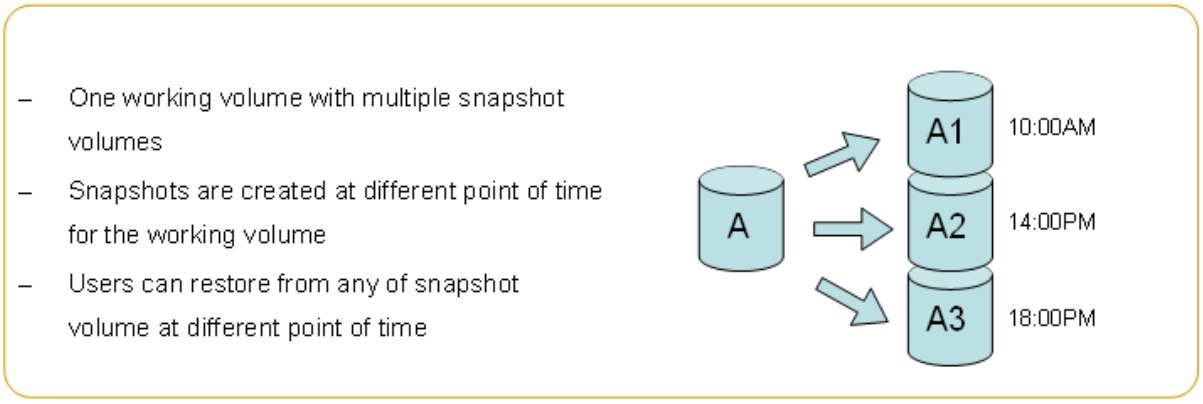
Snapshot

A snapshot is initialized with a data duplicate from a source to a target. The mirror snapshot is offered by the ExaSAN RAID controller.

> **Note**
> The source and target volume of the snapshot must be identical.

Before setting a snapshot, you need to set the slice in the array. The capacity of each slice and the number of shots should be in accordance with the space you need.

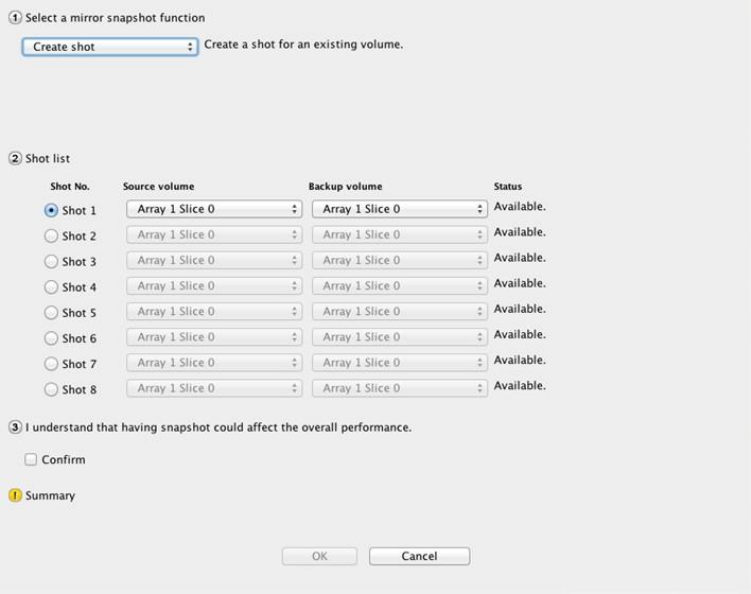
In the figure above, a snapshot can be created by splitting the source and target after the background sync is completed. The I/O mirroring is stopped, and the difference is under tracking in a bitmap table to support fast re-sync.


– One working volume with multiple snapshot volumes
– Snapshots are created at different point of time for the working volume
– Users can restore from any of snapshot volume at different point of time
A
A1
A2
A3
10:00AM
14:00PM
18:00PM

Create Shot

Create a snapshot of the selected slice. A maximum of 8 shots can be created. Once all shots have been used, older shots must be deleted before new ones can be taken.

1. Select the **Create Shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
3. Check the **Confirm** box and click **OK** to take a snapshot.



Delete Shot
Delete the selected shot.

1. Select the **Delete Shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
3. Check the **Confirm** box and click **OK** to delete a snapshot.

Split Shot
Split Now –
Split the selected shot or changes scheduling. The shot is split and read as two separate shots; therefore, it becomes two separate slices after being split.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Split Now radio button.
3. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
4. Check the **Confirm** box and click **OK** to split the snapshot.

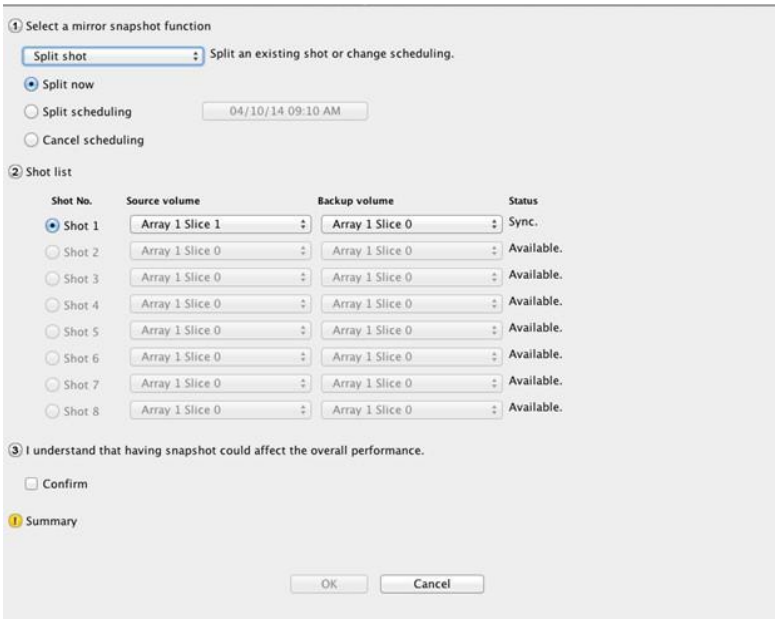
Split Scheduling –
Set any time to split shot.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Split Scheduling radio button.
3. Click on the time and date button to set split time.
4. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.

5. Check the **Confirm** box and click **OK** to split the snapshot.

Cancel Scheduling –
Cancel the split shot scheduling.

1. Select the **Split Shot** function from the drop down menu.
2. Select the Cancel Scheduling radio button.
3. Select the required shot by clicking on the Shot No. radio button. From the respective drop down menus, select the source volume and destination volume. Unavailable shots are grayed out.
4. Check the **Confirm** box and click **OK** to split the snapshot.



Resynchronize Shot
Resynchronize the selected shot. This function can speed up mirroring for previous snapshots.

1. Select the **Resynchronize shot** function from the drop down menu.
2. Select the required shot by clicking on the Shot No. radio button. You can only select split shot for resynchronization.
3. Check the **Confirm** box and click **OK** to split the snapshot.

Note
1. The destination volume must be equal or larger in size than the source volume.
2. The source volume and the destination volume can be on different arrays.
3. The destination volume must NOT be mapped to a LUN.
4. A shot will not be deleted if the details of the array change. The only way to delete a shot is using the Delete Shot function under Snapshot.

Health Center

To ensure the accuracy of the RAID parity data, ExaSAN RAID controller offers Background checking and “Rebuild parity data”. During checking or rebuilding parity, the performance of the array will be affected. You may check the progress of in the Main view or in the Health Center.

Follow the steps below to select an array to verify, rebuild, or condition.

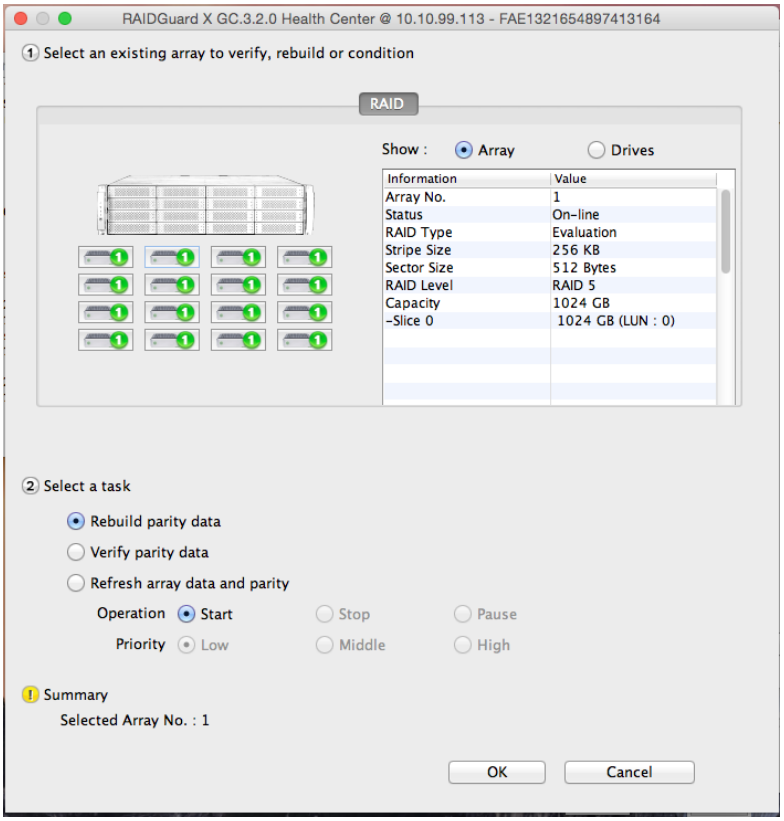
1. Select the Array to verify, rebuild, or condition.
2. Click the radio button to:

   Rebuild the parity data – Rebuilding parity on an array uses the data on the array to create new parity data, no repair problems with the data.

   Verify the parity data – Verify that the data is free of errors.

   Refresh array data and parity – Select the priority between Low, Med., or High. This process scans, rewrites, and scrubs bad data conditions caused by excessive vibration during drive I/Os, or data degradation caused by Adjacent Track Interference (ATI).

3. Click OK to start the operation.



4. The main array information screen will indicate that the array is undergoing rebuilding, verification, or refreshing.

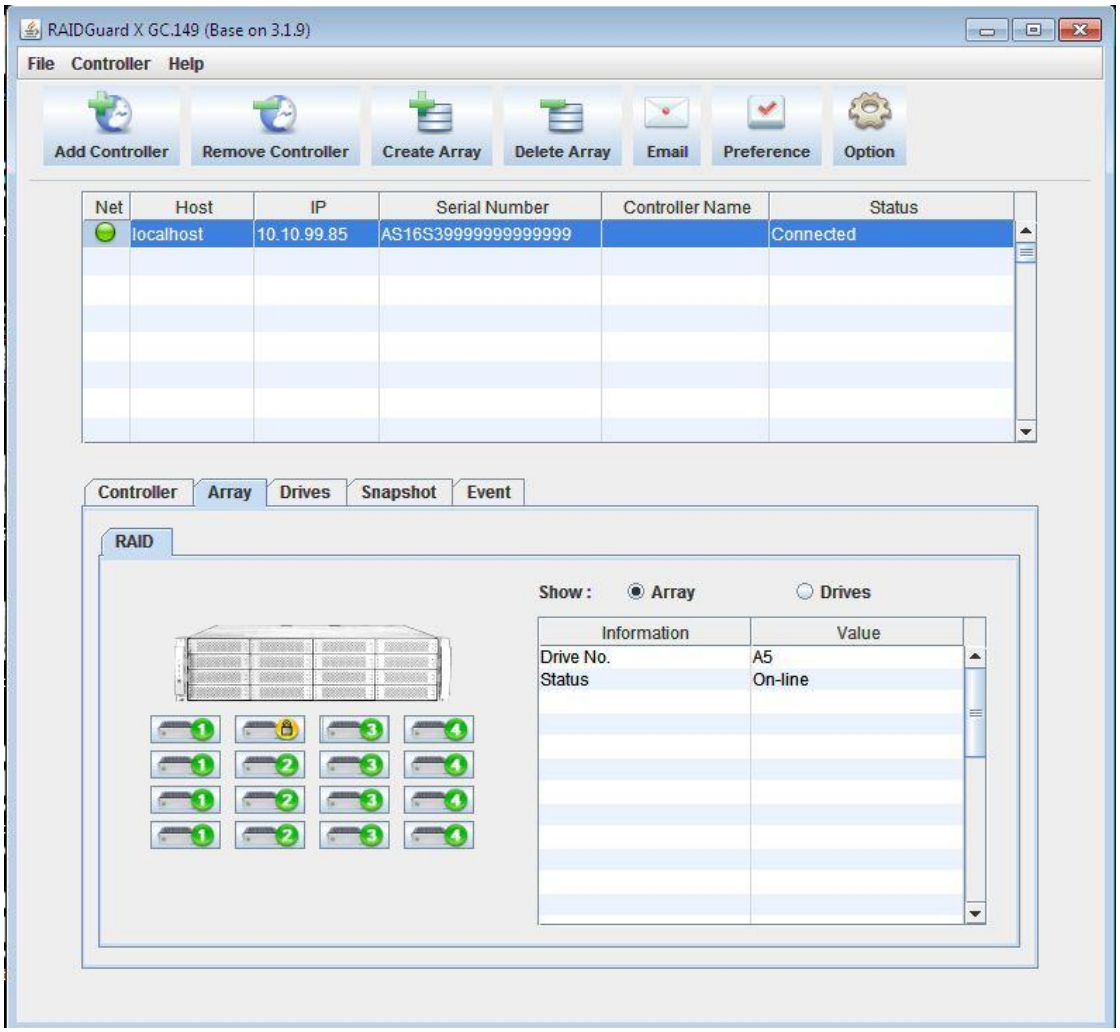
Unlock Drives

The RAID controller may lock abnormal drives in an array. You may unlock these drives and rejoin them in an array. Drives may be locked with one of two conditions:

1. If a drive returns data too slowly, the controller determines the drive is experiencing a fault and executes Drive Drop. When you unlock the drive, it will be added directly to the array if there has not been drive access during the locked period. Otherwise, the controller will rebuild parity data on the drive when the drive is online.

> **Note**
> If “Drive Drop" occurs, it is recommended to use S.M.A.R.T. to check the drive condition and replace it if necessary.

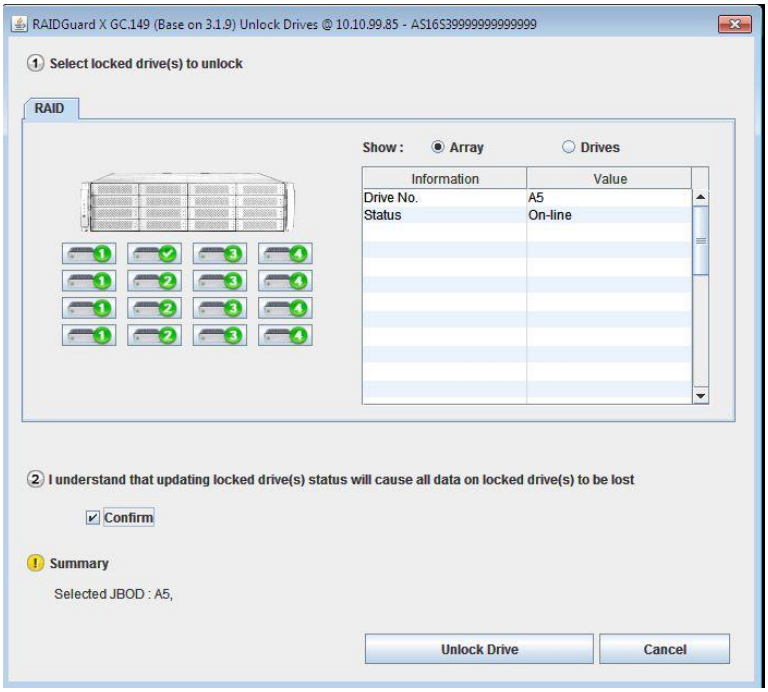
2. When a drive has been used by ExaSAN RAID system, that drive will be locked if insert it to another RAID system.



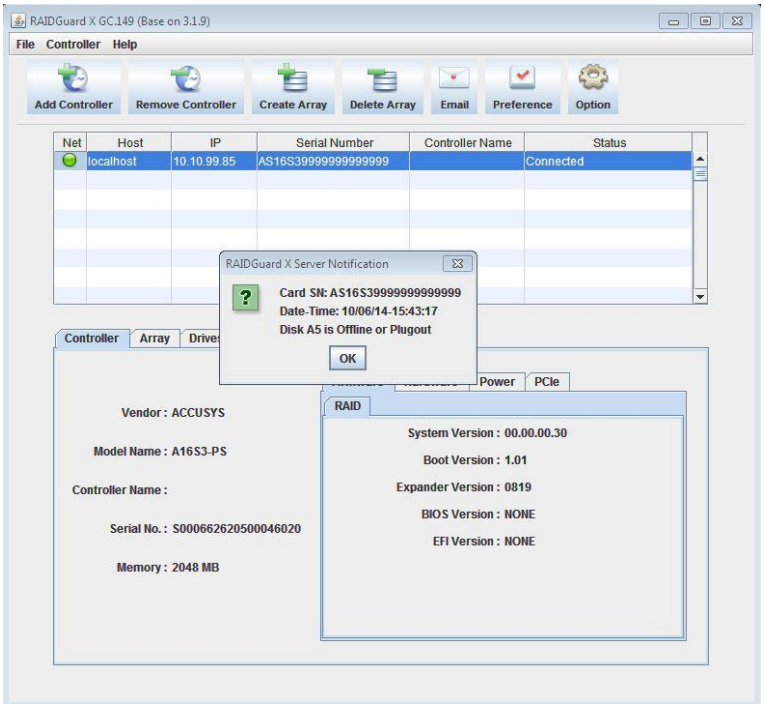
Drive 5 Locked

Follow the steps below to select a drive to unlock.

1. Select the drive with the icon. It will change to the icon.



2. Check the **Confirm** box and click **Unlock Drive**.



Appendix C: Customer Service and Support

B.1 Get Log

When you contact us for technical support, our support staff might ask for your system log file for troubleshooting purpose.

1) RAID controller log by Dump controller log of RAIDGuard X
2) Switch log from Event Management of ExaSAN webGUI.
3) Client operation system log. (it's better to record related error message.)

B.2 Contact Us

For customer services and technical support, locate an Accusys office near you from the link below:

http://www.accusys.com.tw/about/contact.htm

Or, you may email us at support@accusys.com.tw

B.3 Our Website

Please visit our websites frequently for the most up-to-date product and support information.

All countries: www.accusys.com.tw

Korea: accusys.co.kr

UL®	**Caution** RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.